~~CONFIDENTIAL~~

Serial No. 31

MARK-UP FOR FINAL SPEC.

SD-482-0-1
Supersedes Detail
Spec. SD-482
Dated 1 March 1951

DEPARTMENT OF THE NAVY
Bureau of Aeronautics
Washington 25, D. C.

DETAIL SPECIFICATION

FOR

MODEL XFY-1 AIRPLANE

(AERODYNAMIC/STRUCTURAL PROTOTYPE FOR CLASS VF CONVOY FIGHTER)

SINGLE PLACE

10 September 1952

Contract NOas 51-936

This document contains information affecting the national defense of the United States within the meaning of the Espionage Laws, Title 18, U.S.C., Sections 793 and 794. The transmission or the revelation of its contents in any manner to an unauthorized person is prohibited by law.

Reproduction of this document in any from by other than naval activities is not authorized except by special approval of the Chief of the Bureau of Aeronautics.

CLASSIFICATION CANCELED
BUNAV WEPS ltr AE-SC-40/A012 10-3-59
Authorized By: Date
Reclassified By: Dept. Date

APPROVED: /s/ J.N. Murphy
Captain, USN
By direction

~~CONFIDENTIAL~~

SECURITY INFORMATION

TABLE OF CONTENTS

	Paragraph No.
INTRODUCTION	
Scope	1a
Applicability of Specification SD-24-F	2a
Changes	3a
CHARACTERISTICS	
Gross weight	102a
Useful Load	103a,b
Weight empty	104a,b
Performance	106a,b
Areas	107a
Dimensions and general data	108a
Control surface and control movements	109a
Three-view drawing	110a
GENERAL	
Complete aircraft	201a,b
Interior arrangement	202a,b
Time allowances	210a
Close tolerance bolts	235a
Rivets	240a
Bearings	275a
Castings	278a-e
AERODYNAMICS	
Stability and control characteristics	302a-c
STRUCTURAL DESIGN CRITERIA	
Structural design requirements	401a
WING GROUP	
General	501a
Ailerons	505a
TAIL GROUP	
General	601a
Fins	609a
BODY GROUP	
Fuselage	701a
Cockpit enclosure	702a
	705a,b

TABLE OF CONTENTS (Cont)

	Paragraph No.
ALIGHTING GEAR - WHEEL TYPE	801a
SURFACE CONTROL SYSTEM	
General	1001a
Design	1001b,c
Emergency system	1002a
ENGINE SECTION	1101a
PROPULSION	
Engine	1202a,b
Engine accessories	1221a
Propulsion system controls	1246a
Propeller	1265a
Starting system	1277
Cooling system	1291a
Lubricating system	1326a
Fuel system	1354a
INSTRUMENTS AND NAVIGATING EQUIPMENT	
Instruments	1401a
Pitot tubes and vents	1403a,b
HYDRAULIC SYSTEM	
General	1501a-g
Type of system	1502a
Operation of system	1510a
PNEUMATIC SYSTEM	1551a
ELECTRICAL	
General	1601a
Wiring	1603a
Power system	1609a-c
Power conversion system	1610a
Exterior lights	1611a
Interior lights	1615a
Instrument electrical system	1622a
ELECTRONICS	
Electronic equipment	1702a-f
Antenna equipment	1703a
Anti-precipitation	1704a

TABLE OF CONTENTS (Cont)

	Paragraph No.
ARMAMENT	
General	1801a
Fixed guns	1803a
Gun charging system	1814a
Gun firing system	1814b
Remote gunfire control system	1817a
Provision for rockets	1835a
FURNISHINGS AND EQUIPMENT	
Seats	1903a-d
Safety belts	1909a
Instrument boards	1911a
Thermal and accoustical insulation	1919a
Fire extinguishing and fire detecting system	1928a
Provision for oxygen equipment	1941a
Cabin pressurization	1944a,b
Quick disconnect	1951a
ANTI-ICING EQUIPMENT	2001a
AUXILIARY GEAR	
Hoisting slings and fittings	2206a
SPECIAL EQUIPMENT	
General	2031a
Engine, cockpit and air intake covers	2306a
Handling trailer	2321a
USEFUL LOAD	
General	2401a
Crew	2403a
Fuel load	2413a
Oil load	2418a
Fixed gun installation	2424a
Rocket installation	2425a
Oxygen equipment	2433a
Photographic equipment	2434a
Miscellaneous equipment	2436a
LIST OF APPENDICES	Page 65

SD-482-0-1

DETAIL SPECIFICATION

FOR

MODEL XFY-1 AIRPLANE

INTRODUCTION

1a. SCOPE.- This specification and its appendices cover the requirements for the design and construction of an aerodynamic and structural prototype of a single place, single engine fighter landplane. The design of this airplane shall include structural strength and equipment installation space required for the military configuration airplane. The primary purpose of this airplane shall be to prove the general feasibility of the military configuration to perform the tactical mission which is to protect convoy vessels from air attack by enemy aircraft.

1b. OPERATION: The airplane shall be capable of vertical unassisted take-off from, and landings on, small platform areas of convoy vessels. The airplane shall be capable of high performance and maneuverability at low and medium altitudes and shall be designed to operate under all weather conditions.

2a. APPLICABILITY OF SPECIFICATION SD-24-F.- Applicable, except that the applicability of paragraphs of General Specification SD-24-F shall be as indicated herein. Unless paragraphs herein completely supersede corresponding paragraphs of the General Specification, paragraphs shall indicate "applicable", "not applicable", "not required", or show specific deviations from or supplement the requirements of the corresponding paragraphs of the General Specification.

3a. CHANGES.- Applicable. The following changes identified by Master Change Record numbers are incorporated in this specification:

MCR	TITLE
1-1	Gas Turbine Compressor - Ground equipment.
1-4	Bolts - Use of NAS Series
1-5	Electrical- Correction of Requirements for Upper Fuselage Lights
1-6	External Fuel Tanks - Deletion of.
1-7	Magnetic Inspection -Use of Amendment No. 1 to Spec. MIL-I-6870

3a. (Cont)

MCR	TITLE
3	Instruments - Thermocouple Thermometer, Change of
4	Electronics - Deletion of Provision for Service Installation of AN/ARC-1
5	Wing Outer Panels and Fins - Interchangeable in Lieu of Integral
6	Bullet-Resistant Glass and Armor Protection - Omission of
14	Titanium Alloy - Use of in Areas Requiring Heat - Resisting Material
15	Configuration Changes - Revised Dimensions, Areas and Movements
17	Strength - Crash Landing Requirements Changes
18	Instruments - Revision of Flight Control Trim Indication

4a. GENERAL SPECIFICATION SD-24-F.- General Specification for the Design and Construction of Airplanes for the United States Navy, No. SD-24-F dated 2 April 1947 including Amendment No. 1 dated 17 March 1948 forms a part of this specification and shall be followed unless otherwise specifically modified herein.

5a. APPENDICES.- Applicable, except that material, process, design, and installation specifications and equipment drawings in effect on 15 December 1950 form a part of this specification, as applicable, except as specifically modified herein.

6. SPECIFICATIONS AND STANDARDS.- Applicable.

7. STANDARD STOCK ITEMS.- Applicable.

8. DEFINITIONS.- Applicable.

9. "BUAER" REFERENCE.- Applicable.

10. SELECTION OF MATERIALS.- Applicable.

11. MATERIALS FOR EXPERIMENTAL AIRCRAFT.- Applicable.

12. MODIFICATION OF GOVERNMENT FURNISHED EQUIPMENT.- Applicable.

SD-482-O-1

13. CONTRACTOR FURNISHED EQUIPMENT.- Applicable.

14a. USE OF "PROVISION" AND "SPACE PROVISION".- The following terms, requiring various degrees of "provision" for a specific item or installation are defined as follows:

(1) "Space provision" means that suitable space only shall be reserved.

(2) "Weight provison" means that suitable weight allowance to simulate later incorporation of the item or complete installation shall be included in the design gross weights for the aircraft, and in all applicable structural design conditions. When weapons are involved, the structural design conditions shall include the effects of weapon reaction and blast loads.

(3) "Power provision" shall mean that the primary electrical, hydraulic or pneumatic power and distribution system shall be sufficient to permit later incorporation of the installation without primary power and distribution system modification.

(4) "Provision for" shall mean that complete installation provision, including all necessary supports, bracketry, wiring, tubing, connectors, interconnecting cables, fittings etc., are installed for securing the item or equipment in place, ready for operation, without further alterations or additional fabrication of parts. Associated fastenings such as nuts and bolts for the item or equipment are not to be included. The item or equipment, including its provisions, shall be included in the weight empty unless specifically stated to be useful load or special equipment.

15. EXPERIMENTAL AIRCRAFT CATEGORIES.- Applicable.

16. DEVIATIONS FOR EXPERIMENTAL AIRCRAFT.- Applicable.

17a. USE OF "SHALL BE PROVIDED" AND "SHALL BE INSTALLED".- The use of the expression "shall be provided" and"shall be installed" when used in regard to an item or an equipment, shall be defined as follows:

(1) The expression "shall be provided" shall mean that the item or equipment is to be furnished and installed by the contractor.

(2) The expression "shall be installed" shall mean that the item or equipment is to be furnished by the Government and installed by the contractor.

18a. MOCK-UP BOARD CHANGES.- This specification includes only those changes made by the Model XFY-1 Airplane Mock-up Board, 29 June 1951-3 July 1951 which are applicable to the aerodynamic/structural prototype airplane

PART I - CHARACTERISTICS

101a. GENERAL.- The following characteristics are considered reasonable for this airplane.

102a. GROSS WEIGHT.- The gross weight is estimated to be as follows:

Aerodynamic/Structural Prototype Airplane	14250#
Convoy Fighter (Military Configuration) (for information only)	16250#

103a. USEFUL LOAD.- The useful load for the aerodynamic/structural prototype airplane shall be as follows:

USEFUL LOAD		3241#
CREW (1)		200#
FUEL AND BALLAST		2471
Engine fuel (363.5 gals. in tanks)	2181	
Ballast	230	
Trapped in system (10 gals.)	60	
OIL		150
Engine (12 gals)	90	
Trapped in system (7.8 gals)	60	
ARMAMENT		83
Simulated Gun Pods	83	
TEST EQUIPMENT		282
Flight test instrumentation	218	
Fire extinguishing system	64	
EQUIPMENT		55
Oxygen	25	
Miscellaneous	29.8	

103b. The useful load for the military configuration shall be as follows: (These are original weights of Spec. SD-482 and are for information only)

USEFUL LOAD		4264#
CREW (1)		200
FUEL		2798
Engine (456 gals in tanks)	2738	
Trapped in system (10 gals)	60	
OIL		150
Engine (12 gals)	90	
Trapped in system (8 gals.)	60	
ARMAMENT		1058
Gun installation (4-20mm)	1058	

103b. (Cont)

EQUIPMENT		58
Oxygen	25	
Photographic (gun camera)	3.0	
Miscellaneous	29.8	

104a. WEIGHT EMPTY.- The weight empty for the aerodynamic/structural prototype airplane is estimated to be as follows:

WEIGHT EMPTY		11009#
WING GROUP		1820
TAIL GROUP		612
BODY GROUP		1017
Fuselage	1017	
ALIGHTING GEAR		467
SURFACE CONTROL SYSTEM		306
ENGINE SECTION		151
PROPULSION		5466
Engines	2902	
Engine accessories	255	
Propulsion system controls	21	
Propellers	1923	
Starting system	33	
Lubricating system	179	
Fuel system	153	
INSTRUMENTS		93
HYDRAULIC SYSTEM		298
ELECTRICAL SYSTEM		368
ELECTRONICS		85
ARMAMENT (provision)		27
FURNISHINGS AND EQUIPMENT		299
AUXILIARY GEAR		0

104b. The weight empty for the military configuration is estimated to be as follows: (This weight is the original weight of Spec. SD-482 and is for information only)

WEIGHT EMPTY		11986#
WING GROUP		1619
TAIL GROUP		426
BODY GROUP		822
Fuselage	822	
ALIGHTING GEAR		300
SURFACE CONTROL SYSTEM		480

104b. (Cont)

ENGINE SECTION (included under fuselage)		0
PROPULSION		6018
Engines	3260	
Engines accessories	266	
Propulsion system controls	31	
Propeller	2120	
Starting system	38	
Lubricating system	121	
Fuel system	182	
INSTRUMENTS		122
HYDRAULIC SYSTEM		305
ELECTRICAL SYSTEM		416
ELECTRONICS		818
ARMAMENT (Provision)		332
FURNISHINGS AND EQUIPMENT		273
AUXILIARY GEAR		55

105. ENGINE CHARACTERISTICS.- Applicable.

106a. PERFORMANCE.- The guaranteed performance of the aerodynamic/structural prototype airplane shall be as follows:

MAXIMUM SPEED AT 35000 FT. ALTITUDE (Knots) (with military power at take-off gross weight, minus 40% fuel)	444
COMBAT CEILING (ft) (at take-off gross weight, minus 40% fuel)	41750
TIME TO CLIMB TO 35000 FT ALTITUDE FROM STAND STILL (Min) (starting with take-off gross weight)	13.1
ENDURANCE	See Note 1
MANEUVERABILITY	See Note 2

NOTE 1 - Endurance shall be not less than 60 minutes and shall be sufficient to allow transition flight plus normal flight testing at low altitudes.

NOTE 2 - Maneuverability shall be such as to provide an adequate indication of the capabilities of the military configuration.

NOTE 3 - The minimum acceleration during the transition from vertical take-off to normal climbing flight shall not be less than 5 ft per second per second at take-off gross weight.

106a (Cont)

NOTE 4 - The above performance is based upon flight of the airplane in NACA standard atmosphere, except as noted above, and under the specified condition of loading with the canopy closed, no external antennas, simulated gun pods in position of minimum drag using the engine and engine power ratings of para. 1202a, and the propeller listed in Appendix 1-A.

106b. PERFORMANCE.- The performance of the military configuration is estimated to be as follows: (for information only)

MAXIMUN SPEED AT 35000 ft ALTITUDE (Knots) (with military power at take-off gross weight minus 40% fuel)	540
COMBAT CEILING (ft) (at take-off gross weight minus 40% fuel)	46000
TIME TO CLIMB TO 35000 FT ALTITUDE FROM STAND STILL (min) (starting with take-off gross weight)	5.1
ENDURANCE	See Note 1

NOTE 1 - Endurance shall be sufficient to meet the following fuel consumption problem. (Fuel consumption data shall be increased in accordance with Specification MIL-C-5011.)

(1) Five minutes at military power for take-off.
(2) Climb to 35000 ft altitude at military power.
(3) Loiter for 1.0 hour at 35000 ft at V for maximum endurance.
(4) Fly out 100 nautical miles at 35000 ft at military power.
(5) Combat three minutes at 35000 ft at military power
(6) Cruise back at speed and altitude for maximum range.
(7) Five minutes at military power for approach and landing.

NOTE 2 - The minimum acceleration during the transition from vertical take-off to normal climbing flight shall not be less than 5 ft per second per second at take-off gross weight.

NOTE 3 - The above performance is based upon flight of the airplane in NACA standard atmosphere, except as noted above, and under the specified condition of loading with the canopy closed, no external antennas, gun pods in position of minimum drag using the engine and engine power ratings of para 1202a of Spec. SD-482 and the propeller listed in Appendix 1-A of Spec. SD-482.

107a. AREAS.- The principal areas are estimated to be as follows: (Not to be used for inspection purposes)

Wing area, including fuselage and elevons		355 sq ft
Elevons (aft of hinge line)	36 sq ft	
Vertical tail area, including rudder		176 sq ft
Rudder (total) (aft of hinge line)	20.4 sq ft	

108a. DIMENSIONS AND GENERAL DATA.- The dimensions and general data of the airplane are estimated to be as follows (not to be used for inspection purposes):

Wings	
Span, maximum	25' 8"
Chord	
At root (centerline of aircraft)	22' 8"
At tip	4' 4"
Mean Aerodynamic	15' 8.6"
Section and thickness (percent chord)	
At root (NACA 63-009 Mod)	9%
At tip (NACA 63-009 Mod)	7.8%
Average	8.6%
Incidence	
At root	0°
At construction tip	0°
Sweepback: Leading edge	57°
Trailing edge	9° 15'
Dihedral (wing chord plane)	0°
Aspect ratio	1.85
Elevons	
Span (each)	9.9"
Chord (percent MAC of wing)	11.7
Tail	
Vertical	
Section thickness	
Root (NACA 63-009 Mod)	9%
Tip (NACA 63-009 Mod)	7.1%
Aspect ratio	3.03
Height over highest fixed part of airplane (tail) (horizontal position)	23' 11"
Length; maximum	34' 11"
Center of gravity	
Horizontal location (percent MAC)	13.0
Ver. location, above fuselage ref line	1.1"
Leading edge of wing (at root) to rudder hinge line (at actuators hinge)	22' 10"

108a. (Cont)

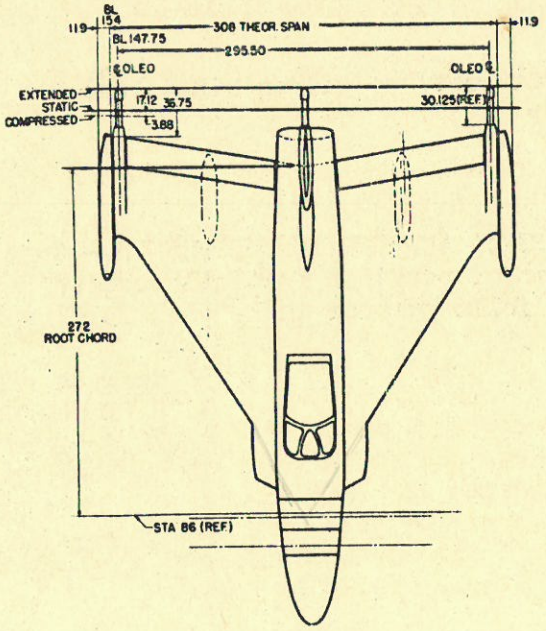
Leading edge of wing (at root) to elevon hinge line	21' 8.9"
Tread of alighting gear	
Wing	24' 7.5"
Vertical fin	19' 4"

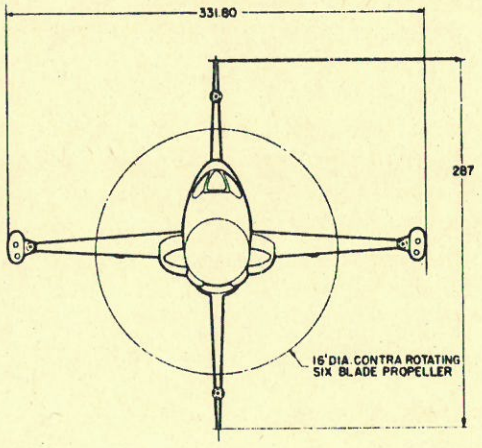
109a. CONTROL SURFACE AND CONTROL MOVEMENTS.- Control movements on each side of neutral position for full movement as limited by stops are estimated to be as follows: (not to be used for inspection purposes)

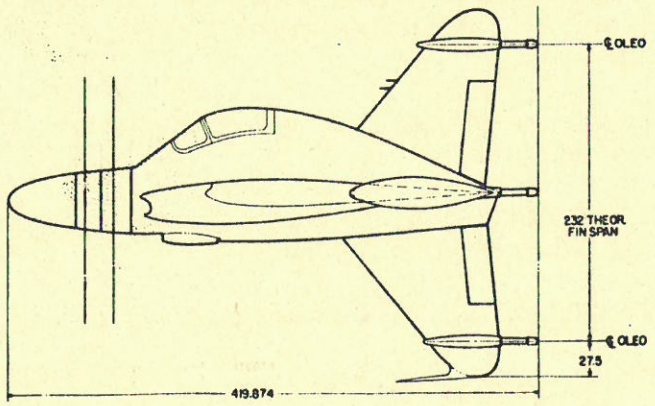
Rudder	30 degrees right, 30 degrees left
Rudder pedals	3.25 inches forward, 3.25 inches aft
Elevon	41.75 degrees up, 41.75 degrees down
Elevon as elevator	34 degrees up, 26 degrees down
Elevator control	8.50 inches aft, 5.00 inches forward
Elevon as aileron	20 degrees up, 20 degrees down
Aileron control	7 inches right, 7 inches left

110a.

~~CONFIDENTIAL~~
SECURITY INFORMATION







MODEL XFY-1

~~CONFIDENTIAL~~
SECURITY INFORMATION

PART II - GENERAL

201a. COMPLETE AIRCRAFT.- The general arrangement of the aerodynamic/ structural prototype airplane shall be in accordance with Appendix 2.

201b. The general arrangement of the military configuration shall be in accordance with Appendix 2A.

202a. INTERIOR ARRANGEMENT.- The interior arrangement of the aerodynamic/ structural prototype airplane shall be essentially in accordance with Appendix 3 and shall be arranged to provide the following:

(1) A simulated radome nose section located forward of the propeller.
(2) An engine accessory and gear box section located below the floor with electronic equipment and space for auxiliary electronic equipment located above.
(3) A pressurized cockpit with engine section below.
(4) A compartment with control equipment and space for electronics with engine section below.

202b. The interior arrangement of the military configuration shall be essentially in accordance with Appendix 3A and shall be arranged to provide the following:

(1) A radome nose section located forward of the propeller.
(2) An engine accessory and gear box section located below the floor with auxiliary electronic equipment located above.
(3) A pressurized cockpit with engine section below.
(4) A compartment for electronics and control equipment with engine section below.

203. DESIGN.- Applicable.

204a. ACCESS AND INSPECTION.- Applicable, except that wing access doors for integral tanks may be structural doors with bolted attachments and need not be hinged. Quick-operating fasteners shall be provided on all non-structural access doors.

204b. Adequate means shall be provided for securing all hinged access doors in open position.

205a. MAIN ENTRANCE DOORS.- Main entrance doors are not required. Entrance shall be through the canopy.

206. SEAPLANE BOARDING.- Not applicable.

207. HATCHES.- Not required.

208a. ESCAPE HATCHES.- Escape hatches, other than the canopy, are not required.

209a. INTERCHANGEABILITY OF PARTS.- Not applicable. However, the wing shall incorporate removable and interchangeable outer panles, and the upper and lower tail fins shall be interchangeable, between airplanes.

210a. TIME ALLOWANCE FOR REMOVAL AND REPLACEMENT OF COMPONENTS.- The design shall be such that each of the items listed below may be removed and replaced in the elapsed time and with the number of men specified. The time allowances do not include time for calibration of instruments or the time required to adjust and check out electronics.

Item	Number of Men	Elapsed Time (Hr.)
Engine (incl prop and simulated radome removal)	4	5.0
Propeller (incl simulated radome removal)	4	3.0
# Radome	2	0.2
# Radar antenna (radome already removed)	4	0.2
Propeller governor	1	0.5
Starter	1	1.0
Generator (DC)	1	1.5
Tachometer generator (each)	1	0.5
Fuel Pump		
Booster (each) (3)	3	1.5
Engine (each) (4)	1	1.0
Oil Cooler	2	1.0
Oil Tank	2	2.0
Oil pressure relief valve	1	0.5
Any instrument	1	0.5
One wing outer panel (after engine removal)	4	5.5
One elevon	2	2.0
One exhaust tail pipe	2	1.5
One fin	2	1.5
One rudder	2	1.0
# Radio transceiver (AN/ARC-27)	1	0.2
Windshield	2	2.5
Battery	1	0.2
Oxygen cylinder	1	0.2
Voltage regulator (DC)	1	0.2
# One gun pod	2	0.5

Applicable to military configuration only

211. DECK SPOTTING.- Not applicable.

212a. TIE-DOWN FITTINGS.- Applicable, except that tie-down fittings shall be as approved by the Mock-up Board.

213. SAFETY OF CREW.- Applicable.

214. CARBON MONOXIDE CONCENTRATION.- Applicable.

215a. VISION.- The vision of the pilot shall be at least 14° over the nose referred to the sight line at Vmax in accordance with the requirements of Spec. SR-187. Every effort shall be made in the design of the windshield and canopy to utilize radii of curvature and angle of incidence which, consistent with aerodynamic and structural consideration, shall result in the least optical distortion in the pilot's cone of vision. Maximum vision shall be provided in the fields of view aft, downward and over the sides of the airplane during take-off and landing maneuver.

216. PROPELLER CLEARANCE (SEAPLANES).- Not applicable.

217. PROPELLER RADIAL CLEARANCE.- Not applicable.

218. PROPELLER CLEARANCE (TAIL WHEEL AIRCRAFT).- Not applicable.

219. GROUND OR DECK CLEARANCE (TAIL WHEEL AIRCRAFT).- Not applicable.

220. GROUND OR DECK CLEARANCE (NOSE WHEEL AIRCRAFT).- Not applicable.

221. ENGINE DEFLECTION EFFECT ON PROPELLER CLEARANCE.- Not applicable.

222. MAXIMUM HEIGHT OF CARRIER AIRCRAFT.- Not applicable.

223a. WALKWAYS AND HANDGRIPS.- Suitable means shall be provided to enable the pilot to gain entrance to and egress from the cockpit with the airplane in the vertical attitude on the ground.

224. MARKING OF PARTS.- Not applicable.

225. MARKING OF OPERATION HANDLES, ETC.- Applicable.

226. ANTI-CORROSION PROVISIONS.- Applicable.

227. INSULATION BETWEEN WOOD AND METAL.- Not applicable.

228. INSULATION BETWEEN DISSIMILAR METALS.- Applicable.

229. FASTENINGS .- Applicable.

230a. NUTS FOR STRUCTURAL APPLICATIONS.- Applicable, except that commercial self-locking nuts of barrel type and approved high heat-treat type may be used.

231. PREVENTION OF BUSHINGS SHIFTING IN FITTINGS.- Applicable.

232a. BOLTS FOR STRUCTURAL APPLICATIONS.- Applicable, except that aluminum or aluminum clad washers may be used. NAS 144 series bolts may be used provided threads are cold rolled after heat threatment. NAS 144 series bolts with cold rolled threads may be rated as specified for NAS 495 series bolts. NAS 495 series or "unbrako" type 495 bolts or a combination of both may be used in tension applications.

233. SHANKS OF STRUCTURAL BOLTS.- Applicable.

234. SINGLE BOLTED STRUCTURAL CONNECTIONS.- Applicable.

235a. CLOSE TOLERANCE BOLTS.- AN 173 through AN 186 close-tolerance series or equivalent bolts or pins shall be used to connect wings, fixed aerodynamic stabilizing surfaces and engine mounts, to their adjacent principal assemblies where 1 or 2 major connections, incorporating not more than 2 shear fastenings per connection, are used for attaching each component. The actual hole diameter by more than 0.0015 inch for bolts or pins of 1.0000 inch diameter or less. For bolts or pins with diameter greater than 1.0000 inch up to and including 1.6250 inch, the actual hole diameter shall not exceed the nominal bolt or pin diameter by more than 0.0020 inch. The following table indicates the maximum and minimum clearances which will result by following the foregoing requirements.

BOLT AN NO.	NOMINAL DIMENSION	BOLT DIAM MAX	BOLT DIAM MIN	HOLE DIAM MAX	HOLE DIAM MIN	CLEARANCE MAX	CLEARANCE MIN
173	.1900	.1894	.1889	.1915	.1900	.0026	.0006
174	.2500	.2492	.2487	.2515	.2500	.0028	.0008
175	.3125	.3117	.3112	.3140	.3125	.0028	.0008
176	.3750	.3742	.3737	.3765	.3750	.0028	.0008
177	.4375	.4367	.4362	.4390	.4375	.0028	.0008
178	.5000	.4991	.4986	.5015	.5000	.0029	.0009
179	.5625	.5616	.5611	.5640	.5625	.0029	.0009
180	.6250	.6240	.6234	.6265	.6250	.0031	.0010
182	.7500	.7488	.7481	.7515	.7500	.0034	.0012
184	.8750	.8737	.8729	.8765	.8750	.0036	.0013
186	1.0000	.9985	.9975	1.0015	1.0000	.0040	.0015
---	1.1250	1.1233	1.1221	1.1270	1.1250	.0049	.0017
---	1.2500	1.2481	1.2467	1.2520	1.2500	.0053	.0019
---	1.3750	1.3728	1.3713	1.3770	1.3750	.0057	.0021
---	1.5000	1.4977	1.4959	1.5020	1.5000	.0061	.0023
---	1.6250	1.6225	1.6205	1.6270	1.6250	.0065	.0025

235a. (Cont)
Note: In lieu of the above, NAS 334 through NAS 340, and NAS 464 series bolts may be used and need not be interchangeable with the AN series.

236a. ALUMINUM ALLOY BOLTS, NUTS AND SCREWS.- Aluminum alloy nuts, bolts and screws may be used in nonstructural lightly stressed parts, subject to the requirements of paragraph 228 of Spec. SD-24-F. National coarse thread series screws may be used in the electrical system installation.

237. HOLES FOR BOLTS, PINS AND RIVETS.- Applicable.

238. SCREW THREADS AND PIPE THREADS.- Applicable.

239. NAILS AND RIVETS IN WOOD.- Not applicable.

240a. RIVETS.- Applicable. "High-Shear" rivets and "Huck" lockbolts may be used. Corrosion resistant steel rivets may be used in locations approved by BuAer.

241a. RIVETED CONSTRUCTION.- Applicable, except that component parts subject to removal and replacement may be secured with bolts or screws.

242. COTTER PINS.- Applicable.

243a. PIANO TYPE HINGES.- Applicable, except that commerical type hinges may be used subject to BuAer approval.

244. TIE RODS.- Applicable.

245. TURNBUCKLES.- Applicable.

246. LUBRICATION OF PARTS.- Applicable.

247. WATERTIGHTNESS OF WINGS AND TAIL.- Applicable.

248. WELDING.- Applicable.

249. BRAZING AND HARD SOLDERING.- Applicable.

250. SOFT SOLDERING.- Applicable.

251. HEAT TREATMENT.- Applicable.

252a. MAGNETIC PARTICLE INSPECTION.- Applicable, except that Spec. MIL-I-6870-1 shall apply.

253a. CABLE ASSEMBLIES.- Applicable, except that Spec. MIL-C-5688 shall apply.

SD-482-O-1

254. EXTREME TEMPERATURE OPERATION.- Applicable.

255. BRACE WIRE CLEARANCES.- Not applicable.

256. CLEARANCE FOR MOVING PARTS.- Applicable.

257. FINISH.- Not required.

258a. INSIGNIA AND MARKING.- Insignia shall be applied in accordance with Spec. MIL-I-6140. Markings shall be in accordance with BuAer Spec. SR-2g-1.

259. COMPARTMENT PRESSURES.- Applicable.

260. JACK PADS.- Not required.

261. DESIGN FOR SHIPMENT.- Not required.

262. DIMENSIONS OF SEAPLANES.- Not applicable.

263. WIND TUNNEL PROVISIONS.- Not required.

264a. VIBRATION.- Vibration requirements shall be as specified in paragraph 401a, 3.61.

265. WOOD CONSTRUCTION.- Not applicable.

266a. METALS.- Applicable, except that the minimum gage of corrosion-resistant steel for structural applications shall be 0.008 inch. The minimum gage of aluminum alloys for structural applications shall be 0.016 inch, except that the minimum gage of 75ST for external covering shall be 0.032 inch. Titanium alloys may be used in the engine installation and in the structure and shrouding surrounding the engine.

267. METAL TUBES.- Applicable.

268a. MAGNESIUM ALLOY.- Applicable. This aircraft shall be considered in the category of aircraft solely operated with wheel-type alighting gear. Consideration shall be given to the necessity for regular inspection of magnesium alloy sections for corrosion and accessibility for proper corrosion treatment without undue disassembly of the structure.

269. LEATHER.- Applicable.

270. FITTINGS.- Applicable.

271a. CORROSION RESISTANCE FOR FITTINGS.- When fittings are to be manufactured by removal of considerable material from the surface of heat treated aluminum alloy 75ST, 14ST, 17ST, and 24ST and are to contain pressed-in bushings, the fittings shall be reheat treated. The reheat treatment operation may be performed on pieces approximately the length of the fittings or after removal of most of the surplus metal. Reheat treatment of fittings which do not contain pressed-in bushings or which are artifically aged after installation of the bushings is not required. This applies only to stock with a least dimension of 2" or more.

272. CONNECTION OF SOLID END FITTINGS TO STRUTS.- Applicable.

273. BUSHINGS.- Applicable.

274. BUSHING TOLERANCE IN ALUMINUM ALLOY FITTINGS.- Applicable.

275a. BEARINGS.- Bearingsused in control system hinges and systems may be of the roller, ball, plain spherical, and journal or sleeve type. The anti-friction type (ball and roller) bearing incorporating contact seals are preferred. All bearings shall be adequately lubricated and readily accessible for additional lubrication as required. Bearings incorporating sealed lubricant features shall be used where space limitations permit their use. All bearings shall be of the highest load capacity and best quality commensurate with space available for installation, design loads, and other pertinent design requirements. They shall be selected specifically for their ability to withstand satisfactorily, steady and unsteady loads compatible with service operating conditions, rapid reversal of loads, oscillations of small magnitudes, misalignments as determined by the flexural characteristics of control surfaces and other pertinent parts or components of the airplane structure, and cumulative tolerances permitted in manufacture and assembly of the airplane. They shall conform to AN standards (such as Spec. AN-B-4b) whenever practicable in order to permit interchangeability or replacement as necessary. Control system bearing ratings, approved by BuAer may be used as developed under NASC Project P36GA, Anti-Friction Bearing Load Ratings. The bearing installation shall be such that wear will be sustained by the bearing itself rather than by the supporting or attaching part, or both.

275b. LUBRICATED SLEEVE OR JOURNAL BEARINGS.- The use of lubricated sleeve or journal bearings for moving parts is limited to installations which are sufficiently rigid to prevent misalignment in any direction of the bearing installation, except that a piano hinge of approved type may be used.

276. BEARING SEALS.- Applicable.

277a. BALL AND SOCKET JOINTS.- Applicable, except that ball and socket joints may be used for engine mounts.

278a. CASTINGS.- The use of castings is permitted for both structural and nonstructural aircraft applications subject to compliance with all applicable directives and specifications issued or used by BuAer (including Spec. ANC-5, SB-73A, MIL-C-6021 (Aer)), and the requirements herein.

278b. Castings used for nonstructural units or parts, such as water stops, spacers, and shims, need not be developed under radiographic magnetic particle, or fluorescent penetrant inspection control, and inspection in accordance with the requirements of Spec. MIL-C-6021 (Aer) is not required. However, visual inspection shall be applicable.

278c. Castings for use in hydraulic systems that are subject to hydrostatic proof tests need not be subject to the requirements of Spec. MIL-C-6021 (Aer) unless sections of such castings are subject to other than hydraulic loads. Such sections shall be subject to the requirements of Spec. MIL-C-6021 (Aer) for structural castings.

278d. Castings shall not be used in the following applications, except when specifically approved by BuAer:

(1) Wing Group

(a) Wing beam flange members, splice plates, or end fittings.
(b) Wing attaching fittings
(c) Engine mounts and attaching fittings
(d) Strut end fittings and attaching fittings

(2) Tail Group

(a) Attachment fittings for all aerodynamic stabilizing surfaces
(b) Strut end fittings and attaching fittings

NOTE: In the case of requests for the use of castings in any of the categories listed above, BuAer may require inspection or test procedures beyond those required in Spec. MIL-C-6021(Aer), if considered necessary to insure the acceptability of the proposed application.

278e. Die castings may be used for Class B and C applications of Spec. MIL-C-6021 (Aer). The use of die castings for Class A castings of Spec. MIL-C-6021 (Aer) shall be subject to the approval of BuAer.

279. EXTERNAL STRUTS.- Not applicable.

280. METAL COVERING.- Applicable.

281. WOOD AND FABRIC COVERING.- Not applicable.

282. CONTROL SURFACE COVERING.- Applicable.

283. CONTROL SURFACE ICE FORMATION.- Applicable.

284a. MEASURING AND LEVELING.- Applicable, except that Spec. MIL-M-6756 shall apply and the provision shall be for the horizontal attitude only.

AERODYNAMICS

301. APPEARANCE.- Applicable.

302a. STABILITY AND CONTROL CHARACTERISTICS.- From level flight, it shall be possible to place and sustain the airplane in an attitude in which it is supported entirely by propeller thrust and made to hover at zero air speed or to fly at small positive or negative air speeds. It shall be possible to perform this transition at low altitudes without exceeding a change in altitude of 500 feet. At all speeds above the lowest level-flight speed from which this transition can be initiated (V_{TR}) the requirements of Spec. SR-119B shall be applicable, except for sections pertaining to conventional landings, wave-offs and take-offs and except as specified in paragraph 302b. If a unique value or range of values of V_{TR} does not exist, V_{TR} shall be defined as the speed corresponding to an angle of attack of 17° with power required for level flight at that angle of attack.

Configuration "TR" shall be defined as that configuration obtained just prior to transition from level flight to hovering flight with power for level flight at V_{TR}. Whenever configurations "L" and "PA" are specified, configuration "TR" shall be substituted, and whenever V_{SL} and V_{SPA} are specified, V_{TR} shall be substituted. In addition, the following requirements shall apply in the take-off and/or landing, as indicated:

(1) Take-off and landing operations shall be possible in winds up to 20 knots in any horizontal direction, with launching vessel speeds up to 15 knots.

(2) The airplane shall be satisfactorily controllable about all axes during vertical take-off and transition to a normal climbing attitude, and about all axes during the transition from level flight to the vertical descent attitude. Yaw and roll dampers may be incorporated for the transition mode.

(3) With the airplane trimmed for zero elevator control force in level flight at any speed from which the transition can be initiated within the limits outlined above, the maximum elevator control force required during the transition to hovering shall be approximately 20 pounds.

(4) With the trim control at a given setting it shall be possible to execute the take-off and transition to a normal climb attitude with a maximum elevator control force of approximately 20 pounds.

302a. (Cont)

(5) Positive stability about all axes shall be required in the vertical descent condition, and may be provided by automatic control if basic aerodynamic stability is not feasible.

(6) In the vertical descent condition, controllability shall be adequate to permit satisfactory and expeditious completion of the landing operation under adverse conditions such as gusty air, rough seas, and the wind velocities specified in (1) above. Control of translational as well as angular motions is essential. With the airplane trimmed for zero pilot forces in hovering flight, the control forces required to permit the landing operation in the vertical descent condition, under the conditions specified in (1) show logical variations with control movements and the maximum forces shall be approximately the following:

Elevator	20 lb
Aileron	10 lb
Rudder	60 lb

(7) The pitch angle required to maintain zero forward speed with no wind shall not be greater than 5° to the vertical relative to the ground attitude of the airplane.

(8) The aerodynamic controls shall be sufficiently powerful to allow hovering at a forward speed of 15 knots in winds up to 20 knots in any direction, at a distance of 2.0 feet clearance above the ground.

(9) There shall be no perceptible reversal of initial response of the airplane to control movement in the hovering flight regime.

302b. Exceptions to Spec. SR-119B are as follows: (paragraph numbers correspond to those of Spec. SR-119B).

4.1 The specified number of cycles to damp may be exceeded provided that the oscillations are definitely stable and the degree of damping is satisfactory to BuAer. If a mechanical device is used to provide the desired damping, it shall be required that no dangerous oscillations can occur under any circumstances upon failure of the damping device.

4.2.1 Applicable, except that at Mach numbers above 0.85 with airplane trimmed at Mach No. =0.85, the variation of elevator force and deflection with Mach number may be unstable if the force changes involved are small and occur over a reasonably wide Mach number range and if the elevator deflections required for trim above Mach number

302b (Cont)

4.2.1 (Cont)

-0.85 are not so large as to limit the maneuverability of the airplane.

7. This section is not applicable during transition. For power-off condition, stall of the airplane can be defined as the attitude attainable with full longitudinal control deflection.

8.1.1 The control system shall be capable of moving the control surfaces at rates that shall in no way restrict the controllability of the airplane.

8.1.2 When the cockpit control is moved at its maximum rate to a given deflection, the control surface should reach its corresponding deflection with a time lag that will not impair the controllability of the airplane.

8.4 Applicable, except that each system shall be capable of providing minimum safe control under all conditions of flight including high speed dive recovery at an acceleration of 3g, transition and hovering.

302c. The longitudinal control force characteristics shall be such that in steady turns, the longitudinal control forces shall continuously increase from the values specified by stability and control requirements at 0.8 limit load factor to not less than 150 pounds and not greater than 300 pounds at the design-ultimate load factor. In abrupt pull-ups it shall require 150-300 pounds stick force to attain the design-ultimate load factors.

303. MASS BALANCE OF CONTROL SURFACES.- Not required.

304. EFFECT OF EXTERNAL STORES.- Applicable.

305. ADJUSTMENT FOR STABILITY OF EXPERIMENTAL AIRCRAFT.- Not required.

STRUCTURAL DESIGN CRITERIA

401a. STRUCTURAL DESIGN REQUIREMENTS .- Strength shall be provided for the requirements of Spec. SS-1C-2 for Class VF Airplanes amplified and modified as follows: (Paragraph numbers refer to those of Spec. SS-1C-2).

2.2 For power-off condition, stall of the airplane shall be defined as the minimum speed attainable in level flight with full longitudinal control deflection.

3.132 GFE weight variation and Government responsibility changes shall not increase or decrease the contract specification design gross weights, but the contractor shall make good the required strength at specified design gross weights including any contractor responsibility overweight.

3.1321 The basic flight design gross weight shall be the take-off gross weight for the military configuration minus the weight of 45 percent fuel.

3.1322 The basic landing design gross weight shall be the take-off gross weight for the military configuration minus the weight of all fuel except that required for 20 minutes hovering.

3.153 Buckling of the wing covering forward of the 60% chord line that will adversely affect the aerodynamic characteristics shall not occur at speeds up to V_L and at load factors up to 1.5.

3.155 Doors, locking mechanisms and cowling fasteners shall not deflect from their intended positions so as to adversely affect strength and aerodynamic characteristics under loads up to design yield loads. Operation of door mechanisms shall not be adversely affected after the structure has experienced loads up to design yield load. No unlocking, unlatching or release of coverings, or unlocking or unfastening of mechanisms shall be permissible at all loads up to design ultimate.

3.17 The requirements of this paragraph 3.17 shall not be applicable to flight loading conditions.

3.211 The flight design parameter for Class VF airplanes shall apply, at the basic flight design gross weight except that the side load factor n_y and the landing approach conditions are not applicable.

3.216 The canopy shall be closed at speeds greater than 165 knots EAS.

3.223 In lieu of Figure 3.223 substitute the curve of Appendix 5.

401a. (Cont)

3.231 Maximum available displacement shall be the displacement as limited by stops and as limited by the application of a 60 pound lateral control force.

3.234 The air speed shall be all air speeds up to V_L. The rudder displacement shall be that attainable with a steadily applied 300-pound rudder pedal force.

3.235 Delete and substitute: The air speed shall be all air speeds up to 0.6 V_H in the basic configuration. The cockpit directional control shall be displaced in 0.2 second to that displacement attainable with a 300-pound pedal force. The 300-pound pedal force shall be maintained until the resultant maximum angle of sideslip is attained.

3.237 Unsymmetrical Horizontal Tail Loads.- Not applicable.

3.244 The airplane shall be in the landing attitude at sea level, hovering over a ship moving at a speed of 15 knots forward with a 20-knot wind from any horizontal direction.

3.32 Strength shall be provided for tail first landing. The design limit loads for recovering from free flight shall be all loads anticipated to occur during recovery as determined, by rational analysis. The limit sinking speed shall be 10 feet per second with respect to the pitching and rolling deck or landing platform. The landing platform shall be considered to be on the centerline, 200 feet aft and 25 feet above the center of motion of the ship. The criteria for roll and pitch of the ship shall be as follows:

	Roll	Pitch
Period (complete cycle)	15 seconds	8 seconds
Amplitude	15° right and left	4° up and down

The design yield and design ultimate sinking speeds shall be the design limit sinking speed multiplied by the square root of the respective factors of safety. Lift in the vertical direction of not more than 0.5W shall be considered applicable at all sinking speeds.

3.3283 and 3.3284 Strength shall be provided in the seat installation for following loads with the seat in either the vertical or horizontal flight positions:

401a. (Cont)

3.3283 and 3.3284 (Cont)

Ultimate Loads: Flight loads and landing, including emergency landing, loading conditions shall apply except that a forward acceleration of 40g shall be considered in addition to the aft acceleration.

Strength shall be provided in the attachments of equipment and useful load items outside the cockpit area, including fuel tanks 1/2 full, if failure of such attachments would result in injury to the airplane occupant for design-ultimate loads resulting from an aft acceleration of the airplane of 30g, a forward acceleration of 30g, and an upward acceleration of 20g.

3.44 With control surfaces inoperative and secured, the airplane shall be secured in winds up to 100 knots from any horizontal direction. The resulting loads from ship's motion shall apply.

3.51 In lieu of 60 knots, substitute 70 knots.

3.6 Crew comfort.

3.61 Permissible magnitude of vibration. The vibration of the pilot's seat, rudder pedals, rudder heel troughs, control stick, and primary structural members in the cockpit during normal cruising conditions shall not exceed 0.004 inch double amplitude.

3.7 Flutter Prevention.

3.71 General. Flutter analysis shall be in accordance with Specification No. SS-23 as modified herein. The requirements of Specification No. SS-23 shall be supplemented as follows: (paragraph numbers refer to those of Specification SS-23).

3.2(e) All data described in Table I except that:

(a) Elastic data presented shall conform to the method of analysis used in calculating the vibration modes.

(b) Vibration mode calculations need not be made for frequencies higher than those which will be used in flutter analysis.

3.32 Change to read as follows: The flutter calculations shall be made for modes which are subject to BuAer approval.

3.35 Change to read as follows: The flutter calculations shall be based on two-dimensional subsonic and supersonic oscillatory air

401a. (Cont)

3.35 (Cont)
force coefficients. If based on the results of these calculations, finite-span corrections are condidered necessary by the contractor, the method of finite-span corrections shall be approved by BuAer.

3.36 Change to read as follows: The results of flutter calculations shall be presented in the form of damping vs. speed curves.

3.72 Tab flutter requirements do not apply.

3.73 For modes involving control surfaces, the flutter analysis shall be made for 25 percent of service ceiling or 10,000 feet, whichever is lower, and for 75 percent of service ceiling or 30,000 feet whichever is lower. For modes not involving a control surface degree of freedom, analyses for the lower altitude only need be made. An altitude survey throughout the range of altitude of the airplane shall be conducted for all modes which appear marginal when analyzed for the conditions outlined above.

3.8 The requirements of Specification No. SS-23 shall apply to all altitudes.

402. ALLOWABLE LOADS AND STRESSES.- Applicable.

403. TRUSS BRACING.- Applicable.

404. PRESSURE DISTRIBUTIONS.- Applicable.

405. OVERTURN STRUCTURE.- Not required.

WING GROUP

501a. GENERAL.- The wing group shall consist of an integral center section and two removable interchangeable outer panels. The wing shall be of full cantilever metal construction and shall include elevons, integral fuel tanks, provision for vertical alighting gear and space provision for gun installations.

502. WING FOLDING.- Not required.

503a. CENTER SECTION.- A separate center section is not required.

504a. WING TIPS.- Separate wing tips are not required. Simulated gunpods shall be provided.

505a. AILERONS.- Elevons shall be provided in lieu of ailerons, and

505a. (Cont)

shall consist of elevon panels with attached fittings, control horns, hinge pins, bolts and nuts, complete and ready for attachment of surface controls. The elevons shall extend to the wing tip oleo strut pods.

506a. AILERON DESIGN.- Applicable to elevon design.

507. HIGH LIFT AND DRAG-INCREASING DEVICES.- Not required.

508. BRACE STRUTS.- Not applicable.

509. BRACE WIRES.- Not applicable.

510. PROVISION FOR FLOATS.- Not applicable.

TAIL GROUP

601a. GENERAL.- The tail group shall consist of one upper and one lower fin and rudder located above and below the fuselage, and provision for alighting gear in a vertical attitude.

602. TAIL SURFACE DESIGN.- Not applicable.

603a. STABILIZER.- A stabilizer is not required.

604. STABILIZER ADJUSTMENT.- Not applicable.

605. STABILIZER REMOVABILITY.- Not applicable.

606a. ELEVATORS.- Elevators are not required. (See paragraph 505a.)

607. ELEVATOR MOVEMENT.- Not applicable.

608. RUDDER.- Applicable.

609a. FINS.- The fins shall be detachable and interchangeable between airplanes.

610a. STOPS.- Applicable to rudder only.

611a. RUDDER-FIN AND ELEVATOR-STABILIZER GAP.- Applicable to rudder-fin only.

612. TRIM TAB LOCATIONS.- Not applicable.

BODY GROUP

701a. GENERAL.- The body group shall consist of the fuselage and provision for equipment therein.

Fuselage

702a. GENERAL.- The fuselage shall be of metal construction with integral wing center section. The engine section shall incorporate provision for installation of the engine specified in paragraph 1202a.

703. COCKPIT.- Applicable.

704. COWLING.- Applicable.

705a. COCKPIT ENCLOSURE.- The pilot's cockpit shall be enclosed by a sliding canopy and shall be pressurized. Canopy seals shall be pressurized whenever canopy is latched and the engine is operating. The canopy shall be power operated with provision for positive emergency operation, should the main power source fail. Plastic conforming to Spec. MIL-P-6886 (AN-P-44) shall not be used.

705b. The cabin enclosure mechanism shall be designed for the following:

(1) It shall be possible to open the canopy from both inside and outside of the airplane when the airplane is at rest without power and with the battery removed.

(2) The canopy power operating mechanism shall be interconnected with the seat tilting mechanism so that the canopy will automatically open when the seat is tilted and will close when the seat is returned to the normal position.

(3) Emergency operation of the canopy in flight will be accomplished as specified in paragraph 1903b and 1903c.

(4) Provision shall be incorporated in the canopy installation to preclude injury to the pilot or damage to the ejection seat installation when the canopy is operated in an emergency or the canopy is lost.

706. BOMBING WINDOWS.- Not applicable.

707. WINDOWS AND PORTS.- Not required.

708. WINDSHIELDS.- Applicable.

709a. FLOORING.- Suitable flooring or equivalent shall be provided in the pilot's cockpit only.

710. CAMERA OPENINGS.- Not required.

711. BAGGAGE COMPARTMENT.- Not applicable.

712a. RADAR EQUIPMENT PROVISION.- Applicable to space provision only.

713. ALIGHTING GEAR FITTINGS.- Not applicable.

714. HANDLING FITTINGS (TAIL WHEEL AIRCRAFT).- Not applicable.

751 thru 760 HULL.- Not applicable.

ALIGHTING GEAR-WHEEL TYPE

801a. GENERAL.- Conventional alighting gear is not required. Special alighting gear for vertical landing shall be provided. One special alighting gear unit including shock absorber and wheel shall be located in each wing tip and in each upper and lower fin.

802. ARRANGEMENT (TAIL WHEEL AIRPLANES).- Not applicable.

803. ARRANGEMENT (NOSE WHEEL AIRPLANES).- Not applicable.

804a. SHOCK ABSORBING UNITS.- Applicable, so far as these requirements apply to alighting gear for vertical landing. The shock absorbing units shall be in accordance with Spec. M-763 except that inflation pressures shall be subject to BuAer approval.

805. FAIRINGS.- Not applicable.

806a. WHEELS AND BRAKES.- Each shock absorber unit shall be equipped with one solid rubber wheel approximately 8 x 3.5 x 4. Each wheel shall swivel 360 degrees and means shall be provided to prevent free swiveling in flight. Brakes are not required.

807. TIRES AND TUBES.- Not applicable.

808. BRAKE SYSTEM AND PARKING LOCK.- Not applicable.

809. TAIL WHEELS.- Not applicable.

810. TAIL WHEEL DESIGN.- Not applicable.

811. NOSE WHEELS.- Not applicable.

812. ALIGHTING GEAR RETRACTION.- Not applicable.

901. through 906. ALIGHTING GEAR-WATER TYPE.- Not applicable.

SURFACE CONTROL SYSTEM

1001a. GENERAL.- Complete surface controls shall be provided for the pilot. The control system shall be a hydraulically-operated, irreversible power system with artificial "feel", and trimming devices.

1001b. DESIGN.- The control system shall be designed to the requirements of Spec. SR-169 supplemented and modified by the requirements of Spec. SR-119B and paragraph 302a of this specification except that control surface locks are not required.

1001c. The rudder pedals shall be so coordinated with the seat tilting mechanism that they will be within reach of the pilot's feet at all times. Rudder pedal travel shall be provided with a constant relationship to the seat travel and in exact phase with the seat travel.

1002a. EMERGENCY SYSTEM.- A completely independent dual power system shall be provided so that, in the event of failure of one of the control systems the remaining system will continue to function. Both systems shall operate continuously and each shall be independently capable of providing the necessary control forces required for safe flying and landing of the airplane. In the event of failure of both power sections of the engine, reserve accumulator capacity shall be required to provide hydraulic power to permit stabilizing the airplane for escape.

1003a. AUTOMATIC PILOT.- Space provision only shall be made for the automatic pilot components of the radar fire control equipment for which space provisions are required.

ENGINE SECTION

1101a. GENERAL.- The engine section includes engine mounts and fittings, firewalls, doors, fairing and provision for equipment.

1102a. ENGINE MOUNTS.- Applicable, except that the mount may be part of the wing structure within the fuselage.

1103a. ENGINE MOUNT DESIGN.- Applicable, so far as these requirements apply to turbo-prop engines.

1104a. VIBRATION ISOLATORS.- Vibration isolators shall be provided.

1105. FIREWALLS (RECIPROCATING ENGINES).- Not applicable.

1106. FLAME TIGHT DIAPHRAGM (RECIPROCATING ENGINE).- Not applicable.

1107a. FIREWALL ENCLOSURE (TURBO-ENGINES).- Applicable, except that corrosion-resistant steel, 0.002 inch thick may be used as a part of the insulating blankets and flame barriers, subject to BuAer approval. Titanium alloys may be used in lieu of corrosion resistant steel in the engine installation and in the structure and shrouding surrounding the engine compartment subject to BuAer approval.

1108. NACELLE STRUCTURE AFT OF FIREWALL.- Not applicable.

1109. NACELLE STRUCTURE FORWARD OF FIREWALL.- Not applicable.

1110. COWLING.- Not applicable.

1111. COWLING DESIGN.- Not applicable.

1112. COWLING ATTACHMENT.- Not applicable.

1113. REMOVABLE PARTS OF COWLING.- Not applicable.

1114. INFLAMMABLE MATERIALS.- Applicable.

1115. COWLING ARRANGEMENT.- Not applicable.

1116. COWL FLAPS.- Not applicable.

1117. INTEGRAL ENGINE WORKING PLATFORMS.- Not applicable.

PROPULSION

1201a. GENERAL.- The propulsion system includes the engine, engine accessories, propeller, propulsion system controls, starting system, lubricating system and fuel system.

Engines

1202a. GENERAL.- Applicable. The engine shall be one Allison Model XT40-A-14 in accordance with Appendix 4 suitable for vertical operation. The engine is rated as follows (Sea level static):

	RPM	Propeller Shaft HP	Jet Thrust In Pounds	Maximum Fuel Consumption Pounds/Hour/ESHP
Take-off	14,300	5060	1162	0.603
Military	13,700	5120	1013	0.592
Normal	13,700	4525	970	0.613

1202b. Space provision only shall be made to install one Allison Model XT54-A-6 engine in lieu of the engine specified in para. 1202a.

1203a. MODIFICATION OF GOVERNMENT-FURNISHED ENGINES.- Applicable. A fixed support tube for the simulated radome may be provided forward of the propeller shafts.

1204a. RESIDUAL OIL AND GREASE.- Applicable except that the weight of the engine shall include propeller governors.

1205. ENGINE INSTALLATION.- Applicable.

1206. INTERCYLINDER BAFFLES.- Not applicable.

1207a. ACCESSIBILITY.- Applicable, while the aircraft is in the vertical position and horizontal position.

1208. ENGINE DRAIN PLUG.- Applicable.

1209a. ENGINE MOUNTING MATERIALS.- Applicable, except that if such materials are used, they shall be adequately protected.

1210a. IGNITION SYSTEM.- The ignition system shielding shall be as furnished with the engine.

1211. IGNITION CIRCUIT PROTECTION.- Applicable.

1212. SHIELDING.- Applicable.

1213. BREATHER PIPES.- Applicable.

1214a. ENGINE TORQUEMETERS.- Not required, however, adequate means of power measurement shall be installed as furnished with the engine.

Engine Accessories

1221. GENERAL.- Applicable.

1222. SUPERCHARGERS.- Not applicable.

1223. CARBURETOR AIR INTAKE PREHEATER.- Not applicable.

1224. PREHEATER CONTROL VALVE.- Not applicable.

1225. CARBURETOR AIR INTAKE THERMOMETER.- Not applicable.

1226. CARBURETOR AIR INTAKE SYSTEM.- Not applicable.

1227. THERMOSWITCH.- Not applicable.

1228a. AIR INTAKE DUCT DESIGN.- Applicable, so far as these requirements apply to turbo-prop engines. The duct areas and routing shall provide the maximum practicable engine intake air pressure under flight conditions.

1229a. ENGINE INDUCTION SYSTEM.- Full consideration shall be given to minimizing pressure losses due to friction and turbulence in the duct entry and ducts. The permissible variation in total pressure at each of the compressor section faces on the engine shall not exceed the following, whichever is greater:

(1) Two psi or 10 percent of the average total pressure whichever is less.

(2) That established by the engine manufacturer and approved by BuAer.

Anti-icing or de-icing provision for the inlet duct, power section shaft housing and compressor inlet bellmouth are not required.

1230. RECIPROCATING ENGINE BACK FIRE.- Not applicable.

1231. ENGINE CHARGE AIR FILTER.- Not applicable.

1232. FUEL DRAINAGE (RECIPROCATING ENGINES).- Not applicable.

1233. ALTERNATE AIR SUPPLY.- Not applicable.

1234. ALTERNATE AIR SUPPLY VALVE.- Not applicable.

1235. INTERCOOLERS.- Not applicable.

1236a. EXHAUST SYSTEM.- Applicable only in regard to turbo-engines.

1237a. EXHAUST SYSTEM CLEARANCE.- Applicable only in regard to turbo-engines.

1238. EXHAUST SYSTEM OUTLET AREAS.- Applicable.

1239. ENGINE HEATER.- Not applicable.

1240. VACUUM PUMPS.- Not required.

1241a. HYDRAULIC PUMP DRAIN LINE.- Applicable. Two hydraulic pumps shall be driven by the engine.

1242a. ENGINE ALTERNATE FUEL PUMP CHECK SWITCH.- A three position switch shall be provided in the cockpit for checking the engine second-

1242a. (cont)

ary fuel pump for each power section. The three position switch shall have the positions of: "Left" (aft) and "Right" (forward). The switch shall be spring loaded in the center (Unlabelled) position. Warning lights shall be provided in the cockpit to indicate primary pump failure.

Propulsion System Controls

1246a. GENERAL.- ANA Bulletin No. 386 shall be used as a guide in lieu of Spec. SR-98.

1246b. The cockpit control system shall be subject to BuAer approval.

1246c. The engine power control lever controlling the two power sections of the engines shall be within reach of the pilot from the normal and hovering flying position. Means shall be provided to prevent the pilot from inadvertently retarding the control lever during take-off.

1247. DESIGN.- Applicable.

1248. RELATIVE MOTION OF CONTROLS.- Applicable.

1249. CONTROL SYSTEM RESPONSE (MULTI-ENGINE).- Not applicable.

1250. FLIGHT ENGINEER'S CONTROLS.- Not applicable.

1251a. CONTROL LEADS AND CONNECTIONS.- Applicable, except that Specs. MIL-F-5442 and AN-C-157 shall apply.

1252. CARBURETOR ALTERNATE AIR VALVE CONTROL.- Not applicable.

1253. STARTER CONTROLS (RECIPROCATING ENGINES).- Not applicable.

1254a. STARTER CONTROLS (TURBO ENGINES).- Applicable, however, the starter air valve shall be controlled by a separate switch.

1255a. INDUCTION AIR DUCT SHUT-OFF VALVE.- Not applicable. However, space provision shall be made for air intake doors controllable from the cockpit. Space provision only shall be made to insure that the doors cannot be closed while the engine is operating, nor shall it be possible to crank engines with the doors closed.

1256. PRIMER CONTROL.- Not applicable.

1257a. PROPELLER CONTROLS.- Applicable, so far as these requirements apply to propeller-turbine engines and are consistent with the type of propulsion controls herein specified. A propeller feathering control shall be provided.

1258. REVERSIBLE PITCH PROPELLERS.- Not applicable.

1259. COMBAT POWER CONTROLS.- Not applicable.

1260a. COOLING AIR CONTROLS.- Applicable only to oil cooler.

Propeller

1265a. GENERAL.- Applicable. The propeller shall be 6 blade, dual rotation, 16'0" diameter, and equipped for feathering.

1266a. SPINNERS AND ANTI-ICING.- The simulated radome specified in par. 1702b shall form the non-rotating portion of the propeller spinner. Provisions for anti-icing propeller hub, blades and spinners are not required.

1267a. PROPELLER ACCESSORIES.- Applicable, except that the rotating portion of the propeller spinner shall be furnished with the propeller, and except that propeller anti-icing equipment and provisions are not required.

1268. GOVERNMENT FURNISHED PROPELLERS.- Applicable.

1269a. PROPELLER FINISH.- Propellers will be furnished with finish and warning stripes.

1270. PROPELLER ADJUSTMENT.- Applicable.

1271. HYDROMATIC FLUID LINES (MULTI-ENGINE).- Not applicable.

1272. PROPELLER OIL.- Not applicable.

1273. SHUT-OFF VALVES (MULTI-ENGINE).- Not applicable.

Starting System

1277. GENERAL.- Applicable.

1278a. STARTER AND ACCESSORIES.- The starter system shall consist of an air turbine starter, starter control valve, switch and wiring.

1278b. GROUND STARTING .- During ground starting the engine ignition system and starter control shall be powered from the aircraft battery or from an outside electrical source. For air starts, electrical power shall be provided for the ignition system only. Provision shall be made for connecting to a ground-based source of pneumatic power.

1278c. The starting system shall be arranged to start either of the two

1278c. (Cont)

power sections. The other section shall be capable of being started from the first section by means of a clutch.

1279. SEAPLANE STARTER OPERATION.- Not applicable.

1280a. STARTING SEQUENCE.- Applicable, however, the starting sequence shall begin by actuating the valve that permits flow of compressed air to the air turbine starter.

1281. CARTRIDGE STARTERS.- Not applicable.

1282. CARTRIDGE STARTER INSTALLATION.- Not applicable.

1283. MISCELLANEOUS STARTERS.- Not applicable.

1284. BOOSTER DEVICES.- Not applicable.

1285. PRIMING SYSTEM.- Not applicable.

1286. HAND CRANKS AND EXTENSION.- Not applicable.

Cooling System

1291a. TEMPERATURES.- The engine installation shall be designed to meet the temperature requirements of the engine and its components as specified in Appendix 4, under the ambient temperature conditions shown in Figure 1 of Spec. E-59d.

1292. WEIGHT OF MECHANICAL PARTS.- Applicable.

1293. DEFLECTION OF HEAT.- Applicable.

1294a. TEMPERATURE INSTRUMENTATION.- Applicable only to the airplane designated for power plant tests. The type of instrumentation shall be subject to BuAer approval.

1295a. SINGLE POINT THERMOCOUPLE EQUIPMENT.- Turbine air inlet temperature indication to the pilot shall be provided. Thermocouples will be furnished with the engines.

1296a. ENGINE DRIVEN GENERATOR COOLING.- Applicable, however the design and location of the cooling air duct shall be such that the cooling airflow is always into the generator blast cooling inlet tube under all operating conditions. Cooling air shall be supplied as required by the generator specification.

1297. AIRFLOW INTERFERENCE.- Not applicable.

1301. thru 1321. LIQUID COOLED ENGINES.- Not applicable.

Lubricating System

1326a. GENERAL.- Applicable. A lubricating system shall be provided for the engine power sections and propeller reduction gear section. The lubricating system shall be designed for the use of the lubricant specified in the engine manufacturer's specification, Appendix 4.

1327a. ARRANGEMENT.- Applicable, except that oil shall be available to the engine power sections and propeller reduction gear section at required pressures and flows down to 10% of the usable oil supply throughout the range of aircraft attitudes which may be encountered during approach, landing, and wave-off.

1327b. The oil system shall provide uninterrupted oil flow to the power sections and propeller reduction gear section under the following conditions at the oil flow rate required for military RPM:

Attitude (measured from chord line)	Minimum time required	Minimum Usable Oil remaining at start of maneuver
90° dive	Time required for dive from service ceiling to minimum safe pull-out altitude.	20%
70° dive	Time required for dive from service ceiling to minimum safe pull-out altitude.	20%
Negative "G"	30 seconds	20%
Any flight attitude from vertical to level flight	Indefinite	20%

1328a. OIL TANK CONSTRUCTION.- Applicable. The oil tank shall be of metal construction to permit pressurization, and shall be subject to BuAer approval.

1329a. OIL TANK CAPACITY.- The capacity of the oil tank shall be not less than 12.0 gallons plus expansion and foaming space.

1330a. OIL TANK EXPANSION AND FOAMING SPACE.- The expansion and foaming space shall not be less than 3 gallons.

1331a. OIL TANK FILLER UNITS.- Applicable, except that the arrangement of the filler units shall permit filling of the oil tank with the airplane in the vertical attitude only. The filler units shall be an approved standard 2-1/2 inch bayonet attachment type. A sounding rod shall be provided.

1332a. OIL TANK SCREEN.- Applicable. Space provision only shall be made for one oil filter in the manifold oil scavenging lines from the power sections.

1333a. OIL TANK LOCATION.- Applicable, except that the oil tank may be located above the gear box, forward of the firewall and need not be near the oil pump.

1334a. OIL TANK VENTS.- Not applicable, however, provision shall be made to depressurize the oil tank for filling.

1335a. PIPING.- Applicable, except that aluminum alloy tubing may be used forward of the firewall. Flight Refueling, Inc., or equivalent pipe connectors for lines one inch in diameter or larger may be used subject to satisfactory performance in tests made by BuAer. Spec. MIL-H-5511 shall apply to flexible hose.

1336a. SIZE OF PIPING, FITTING AND CONNECTIONS.- Applicable only to feed and return lines.

1337a. FLANGED CONNECTIONS.- Applicable, except that 3-bolt flanged connectors for 1" and 1 1/4" O.D. tubing and 4-bolt flanged connectors for 1 1/2" to 2" O.D. tubing may be used.

1338. PIPING INSTALLATION.- Applicable.

1339a. OIL COOLERS.- Applicable. An oil cooler shall be provided for the engine in accordance with Spec. MIL-C-5637. An automatically controlled flap with switch override shall be provided for the oil cooler air exit.

1340a. TEMPERATURE CONTROL.- Applicable, except that a warm-up compartment in the oil tank is not required.

1341. OIL IMMERSION HEATERS.- Not applicable.

1342. MAINTAINING OIL IN FLUID STATE.- Applicable.

1343a. OIL TEMPERATURE THERMOMETER.- Applicable, except that provision to measure the temperature of the oil leaving the engine is not

1343a. (Cont)

required. A thermometer well for measuring the temperature of the oil in the supply line to the gear box shall be provided as close to the oil tank as practicable.

1344. THERMOMETER WELLS.- Applicable.

1345. OIL PRESSURE GAGE.- Applicable.

1346a. DRAINAGE.- Applicable, except that requirement may be modified to suit engine and oil cooler requirements. It shall be possible to drain the system while the aircraft is in the vertical position.

1347. OIL DILUTION SYSTEM.- Not required.

1348a. OIL SHUT-OFF VALVES (MULTI-ENGINE).- Not applicable, however a shut-off valve shall be provided.

1349. OIL FOR PROPELLERS (MULTI-ENGINE).- Not applicable.

Fuel System

1354a. GENERAL.- Applicable, except that the fuel system shall be designed in accordance with Spec. SR-73D except as otherwise specified herein. Certain paragraphs from 1355 thru 1387 of Spec. SD-24-F are superseded by Spec. SR-73D as indicated herein.

1354b. The fuel system shall be designed for use with fuels conforming to Spec. MIL-F-5572 (gasoline).

1355. TYPE OF SYSTEM.- Superseded by Spec. SR-73D, par. 3.7.

1356. MATERIALS AND ACCESSORIES.- Superseded by Spec. SR-73D, par. 3.2.2.

1357. FUEL SYSTEM DIAGRAM.- Not required.

1358. FUEL SYSTEM ARRANGEMENT.- Superseded by Spec. SR-73D, par. 3.6.

1359. VAPOR DILUTION SYSTEM.- Not applicable.

1360. FUEL PUMPS.- Superseded by Spec. SR-73D, par. 311.

1361a. AUXILIARY FUEL PUMPS.- Applicable, except that filters may be located downstream of the auxiliary fuel pumps, and the auxiliary pumps need not be near the fuel shut-off valves.

1362a. FUEL TANK LOCATION.- The fuel tanks shall be integral and located in the wing.

1363a. FUEL TANK CAPACITY.- The total usable fuel capacity shall be not less than 576 gallons and shall be carried as follows:

Location	Protection	Capacity
Left wing	None	288 gals.
Right wing	None	288 gals.
	Total	576 gals.

1364. RESERVE FUEL SUPPLY.- Not required.

1365a. FUEL TANK CONSTRUCTION.- Fuel tanks shall be integral and not self-sealing. Anodized aluminum alloy maybe used in the fuel tanks subject to BuAer approval.

1366. AUXILIARY FUEL TANKS.- Not required.

1367a. FUEL TANK FILLER UNITS.- Superseded by Spec. SR-73D, par. 3.9.1, except that pressure fueling and defueling are not required.

1368a. FILLER UNIT SIZE AND ARRANGEMENT.- Superseded by Spec. SR-73D, par. 3.9, except that fueling and defueling shall be possible with the airplane in the vertical attitude only.

1369. FUEL TANK STRAINERS.- Superseded by Spec. SR-73D, par. 3.10.

1370a. FUEL AVAILABILITY.- Fuel shall be continuously available to the engine at any possible sustained flight attitude down to 10% fuel remaining, and at the 90° landing attitude with 1% fuel remaining.

1371. FUEL AVAILABILITY FOR DIVING MANEUVERS.- Not applicable. (See par. 1370a.)

1372. FUEL TANK VENTS.- Superseded by Spec. SR-73D, par. 3.7.1.

1373a. FUEL TANK PRESSURE SYSTEM VENTS.- Superseded by Spec. SR-73D, par. 3.7.1, except that space provision only shall be made for fuel tank pressurization.

1374. FUEL TANK SUMPS AND DRAINS.- Superseded by Spec. SR-73D, par. 3.8.

1375. DRAINED FUEL CONTAINER.- Not required.

1376a. FUEL DRAINAGE.- Superseded by Spec. SR-73D, par. 3.9.3, except that drainage shall be with the aircraft in the vertical position only.

1377a. PIPING.- Applicable, except that self-sealing hose is not required and Flight Refueling Inc., or equivalent pipe connectors for lines

1377a. (Cont)

1 inch O.D or larger may be used subject to satisfactory performance to tests made by BuAer. Spec. MIL-H-5511 shall apply to flexible hose.

1378a. SIZE OF PIPING, FITTINGS AND CONNECTIONS.- Superseded by Spec. SR-73D, par. 3.3.1 except that 3/8 O.D. piping may be used for sump and scupper drain lines, valves and connections and 1/4 O.D. drain lines may be used for air bleeds, thermal relief drains, etc.

1379. FUEL PIPING IN WING SURFACES.- Applicable.

1380. FUEL LINE FUME TIGHT DUCTS.- Not required.

1381. FUEL SHUT-OFF VALVES (MULTI- ENGINE).- Not applicable.

1382a. FUEL QUANTITY GAGES.- A null capacitor type fuel quantity gage system for gaging of all tanks, including external auxiliary tanks, in accordance with Spec. AN-G-31a shall be provided. This system shall automatically compensate for varying fuel density and dielectric constant. Dial range shall be adequate to indicate full tanks of fuel weighing 7 pounds per gallon and the scale shall be linear. Accurate gaging shall be provided for both vertical and level flight attitudes.

1383. FUEL SYSTEM STRAINERS AND FILTERS.- Superseded by Spec. SR-73D, par. 3.10.

1384. CLEANING STRAINERS IN FLIGHT.- Not applicable.

1385. FUEL DUMP VALVES.- Not required.

1386. SEAPLANE FUEL DRAINAGE.- Not applicable.

1387. CORROSION INHIBITORS.- Applicable.

1391. thru 1393. WATER INJECTION SYSTEM.- Not applicable.

1397. UNCONVENTIONAL PROPULSION INSTALLATION.- Not applicable.

INSTRUMENTS AND NAVIGATING EQUIPMENT

Instruments

1401a. GENERAL.- Applicable. The following instruments shall be installed convenient to the pilot except as noted:

One accelerometer
One altimeter (airplane)
One indicator (cabin altimeter pressure)

1401a. (Cont)

One clock (elapsed time)
Two indicators, hydraulic pressure
One indicator, airspeed
One indicator, climb
Two indicators, oil pressure (power sections)
One indicator, oil pressure (reduction gear)
One indicator, oil temperature
Two indicators, turbine air inlet temperature (CFE)
Two indicators, tachometer (turbine speed)
One fuel quantity gage (CFE)
One indicator, power measurement (Allison equipt.)
One indicator, (dual) turbine time (need not be located in cockpit)
One compass, standby
One indicator, gyro horizon
One indicator, turn and bank
One indicator, elevon longitudinal trim position (CFE)

1402. FLIGHT TEST INSTRUMENTS.- Applicable.

1403a. PITOT TUBES AND VENTS.- One electrically heated pitot static tube shall be installed in accordance with Spec. MIL-I-5072, except that stalling speed shall be defined as specified in par. 401a, 2.2.

1403b. A dual heated total head tube installation shall be provided for operation of artificial feel mechanism.

1404. PIPING AND CONNECTIONS.- Applicable.

1405. THERMOSWITCH EQUIPMENT.- Not applicable.

1406. VENTURI TUBES.- Not applicable.

1407a. THERMOMETERS.- Applicable only to oil temperature thermometers.

1408. THERMOCOUPLE EQUIPMENT.- Applicable.

1409a. QUANTITY GAGES.- Fuel quantity gage equipment shall be provided as specified in paragraph 1382a.

1410a. V-G RECORDER.- Applicable, however the weight of the V-G recorder shall not be included under weight empty or useful load.

1411. POSITION INDICATORS.- Not required.

1451. NAVIGATING.- Not applicable.

HYDRAULIC SYSTEM

1501a. GENERAL.- Hydraulic systems shall be provided for the operation of the surface control system, and normal canopy operation in accordance with Spec. MIL-H-5440 except as modified herein. Space provision shall be required for larger pumps and necessary hydraulic equipment for the military airplane configuration.

1501b. Two completely independent surface control systems shall be provided.

1501c. The surface control hydraulic systems shall be completely independent of each other for control about each axis unless it can be proven that simultaneous loss of control about any two or all three axes is no more detrimental to the airplane than the loss of control about any one axis.

1501d. The number of units in each system shall be kept to an absolute minimum consistent with the functional requirements of the system.

1501e. Hydraulic fluid shall be non-flammable fluid in accordance with Spec. MIL-F-7083 (Aer).

1501f. Fluid measurement in hydraulic reservoirs shall be by means of sight gages which shall indicate the fluid level ranges required for satisfactory operation of the systems. A dip stick does not constitute a sight gage. Sight gages need not be visible to the pilot.

1501g. The canopy shall be operated by one of the surface control systems. Provision shall be made for manually cutting out this utility item from the surface control system. Fuses shall cut out the utility item and prevent loss of fluid in case of line failure. Space provision only shall be made for operating engine air duct doors by one of the surface control systems.

1502a. TYPE OF SYSTEM.- Surface control systems may be of the pressurized in flight type subject to BuAer approval. The operating pressure of hydraulic systems shall be 3000 psi.

1503a. PUMPS.- Engine driven hydraulic pumps shall be of the variable volume type. Surface control systems shall be powered by engine driven pumps.

1504. BRAKE CONTROL VALVE.- Not applicable.

1505. PUMP BY-PASS (SHUT-OFF) VALVES.- Not required.

1506. FLEXIBLE HOSE.- Superseded by Spec. MIL-H-5440.

1507a. EMERGENCY FOR UTILITY SYSTEMS.- Not required. (See par. 1501g.)

1508. EMERGENCY SYSTEM COMPONENTS.- Not applicable.

1509a. AIR BOTTLE INSTALLATION.- Not applicable. (See par. 1552a.)

1510a. OPERATION OF SYSTEM.- Each surface control system shall be so designed as to operate satsifactorily regardless of the position or condition of any unit (except actuating cylinders and shuttle valves) which forms a part of the other system, and regardless of the existence of any pressure or flow up to and including flow in the other system.

1511a. ELECTRICALLY OPERATED HYDRAULIC UNITS.- Electrically operated hydraulic units shall be kept to an absolute minimum. Adequate justification shall be submitted for use of any such units. When the use of solenoid actuated valves is justified and approved by BuAer, they shall contain "dry" type solenoids.

1512a. GROUND TEST EQUIPMENT ATTACHMENTS.- Adequate self sealing quick couplings shall be provided for attachment of ground test equipment. The airplane hydraulic power source shall not be usable for ground servicing.

1513a. ADDITIONAL DEVIATIONS TO SPEC. MIL-H-5440.- Additional deviations to Spec. MIL-H-5440 are as follows: (paragraph numbers refer to those of Spec. MIL-H-5440.)

3.8.2 Cylindrical hydraulic pressure accumulators may be used.

3.8.8.3 Mechanical override mechanisms for electrically-controlled valves may be ommited, subject to BuAer approval.

3.8.10 "Ermeto" fittings may be used in lieu of those conforming to Spec. MIL-F-5509.

3.8.14 Remote indicating hydraulic pressure instruments may be used.

3.8.25.5 Pressure may be determined by pump requirements.

3.8.29.3 Pressure may be determined by pump requirements.

PNEUMATIC SYSTEM

1551a. GENERAL.- The airplane shall be equipped with a low pressure pneumatic system using Spec. MIL-P-5518 as a guide. The system shall include the required lines, fittings, valves and controls and shall be used for the following purposes:

1551a. (Cont)

Cockpit pressurization and heating
Canopy seal pressurization
Hydraulic reservoir pressurization
Oil tank pressurization
Anti-blackout suit

1552a. A separate system shall be provided to store and supply air pressure to the hydraulic actuating cylinder for canopy emergency operation. Space provision only shall be made for a separate system, in accordance with Spec. MIL-P-5518, as applicable, to store and supply air pressure for operation of pneumatic gun chargers and feed mechanisms for the military configuration.

1552b. Space provision only shall be made for recharging and gaging the gun charging pneumatic system from an external source.

ELECTRICAL

1601a. GENERAL.- Applicable, except as specified herein.

1602. "R" DRAWINGS.- Applicable.

1603a. WIRING.- Applicable, except that Spec. MIL-W-5088 shall apply and wire coding may be on terminal ends only. Aluminum wire conforming to Spec. AN-C-161 may be used for wire sizes #8 and larger. Cable in accordance with Specification XEL-38 and USAF 32659 shall be used in high temperature areas.

1604a. EQUIPMENT.- Applicable, except that Spec. MIL-E-7080 shall apply. Fuses may be used between the primary sources of power and the main junction boxes and also in lightly loaded circuits such as for instruments etc. Shock mounts for voltammeter are not required.

1605a. BONDING.- Bonding shall be in accordance with Spec. MIL-B-5087, except that lightning protection for the pilot is not required.

1606a. RADIO INTERFERENCE LIMITS.- Interference shall be within limits consistent with those required for experimental flying.

1607a. SOLDERING AND WATERPROOFING CONNECTIONS.- Not required for these aerodynamic/structural prototype airplanes.

1608a. CONSOLE PANELS. - Metal console panels may be provided. Space provision only shall be made for alternate console panels in accordance with Spec. EI-207-1 and AN-P-89-1. Cover boxes may be omitted when the underside of the panel is enclosed by structure or fairings. The engine

1608a. (Cont)

control panel shall be located as approved by the Mock-Up Board. Lighting is not required for console panels.

1609a. POWER SYSTEM.- The electrical power system shall consist of adequate size generator, battery and controls. The power equipment specified in Appendix 1-A shall be subject to change based on acceptable load analysis. The battery mount shall be gimbaled to maintain the battery in a substantially horizontal position during hovering, transition and normal flight attitudes. The battery disconnect shall be readily removable without rotating the battery.

1609b. The electrical system shall provide both DC and AC power. One 400 ampere generator and regulator shall be installed. The generator shall be driven by the engine. The AC power shall be provided by the inverter specified in para. 1610a. Space provision shall be made for an E-1822-1 AC generator and E-1822-2 voltage regulator.

1609c. The DC power system shall be in accordance with applicable "R" drawings.

1610a. POWER CONVERSION SYSTEM.- An inverter shall be installed as required to furnish AC power. The power conversion equipment specified in Appendix 1-A shall be subject to change based on acceptable load analysis. Space provision shall be made for the alternate installation of an E-1737-1 inverter.

1611a. EXTERIOR LIGHTS.- Applicable, except that space provision only shall be made for exterior lighting. Dwg. R-203G and R-204J shall apply to this provision, except that formation lights and tail surface flood lights are not required. Space provision only shall be made for two upper and one lower fuselage lights so located as to be shielded from view of the pilot. Streamline lights may be used. A coder is not required for position light flasher.

1611b. Circuitry for exterior lights for which space provisions are required shall be such that the fuselage lights, wingtip lights, and tail lights are all on in the normal bright condition in the "on-normal" position. The "on-dim" position shall dim the upper fuselage lights only, with the other lights remaining in the normal bright condition.

1612. APPROACH LIGHT.- Not applicable.

1613. LANDING LIGHTS.- Not applicable.

1614. SIGNAL SPOTLIGHTS.- Not required.

1615a. INTERIOR LIGHTING.- Applicable, except that space provision only shall be made for interior lighting in accordance with Spec, SR-127b and Dwg. R-209D. Space provision only shall be made for edge lighting of

1615a. (Cont)

the instrument panel for the military airplane.

1616a. ARMAMENT ELECTRICAL SYSTEM.- Applicable, except that space provision only is required.

1617a. ELECTRIC GUN HEATERS.- Applicable to gun heating systems specified in paragraph 2424a, except that space provision only is required.

1618. IGNITION AND STARTING SYSTEM (RECIPROCATING ENGINES).- Not applicable.

1619a. IGNITION AND STARTING SYSTEM (TURBO ENGINES).- The system shall be in accordance with paragraph 1254a.

1620a. RECEPTACLES.- Applicable. One combination DC and AC break away connector receptacle shall be provided.

1621. STATIC DISCHARGE DEVICE.- Required.

1622a. INSTRUMENT ELECTRICAL SYSTEM.- Applicable. The inverter shall supply power for electrically operated flight and engine instruments. A warning light shall be provided to show "inoperation" of this system. Each instrument shall be individually connected to the power source by means of a suitable fuse or circuit breaker to isolate the instrument in the event of a fault. Space provision only shall be provided for manual transfer when AC power source, for which space provisions are made, is installed.

1623. AUDIBLE WARNING DEVICES.- Not required.

ELECTRONICS

1701. GENERAL.- Applicable.

1702a. ELECTRONIC EQUIPMENT.- An AN/ARC-1 command set shall be installed. Space provision only shall be made for the following electronic equipment.

Equipment	Specification
AN/ARC-27 UHF Transceiver	B/A 51A2D6, B/A E-1840
AN/ARA-25 UHF Direction Finder Group	
AN/ARN-22 Radio Altimeter	
AN/APX-6 IFF	EI-166 COAN16-30APX-6-3
AN/APQ-47 Radar (See para. 1817a.)	

1702b. A fixed section simulating a radome for the AN/APQ-47 radar equipment shall be mounted forward of the propeller.

1702c. Metal console panels shall be provided. Space provision only shall be made for alternate aircraft equipment consoles in accordance with Spec. EI-207-1 and AN-P-89-1 for mounting all remote control panels for electronic equipment.

1702d. Space provision shall be made for the AN/ARN-21 equipment. The space provision for the antenna shall be in the upper fin.

1702e. Government furnished electronic equipment components may be rigidly mounted in a shock mounted rack. Units located on this rack may be mounted on special contractor furnished mounting base.

1702f. Space provision only shall be made to supply cooling air to electronic equipment as required.

1703a. ANTENNA EQUIPMENT.- The Contractor shall install an AT 145/A antenna for the AN/ARC-1 equipment. Space provision only shall be made for antennas for the other equipment listed in paragraph 1702a.

1704a. ANTI-PRECIPITATION.- Applicable. Dischargers shall be provided and if the communication and navigation antennas are located internally, the housing shall have a semi-conducting surface of 0.1 to 10.0 megohms per square resistivity.

ARMAMENT

1801a. GENERAL.- Space provision only shall be made for fixed guns or alternate rockets, and radar gun and rocket control equipment.

1802a. ARMAMENT INSTALLATION.- Applicable to space provision only.

1803a. FIXED GUNS.- Applicable, except that space provision only shall be made for the fixed gun installation specified in paragraph 2424a in accordance with Spec. SR-21E except as modified herein. Bore sighting fittings are not required. Space provision only shall be made for wing tip pods to carry fixed guns. Simulated gun pods shall be provided.

1803b. Space provision only shall be made for a calibrated scale at the rear mount of each gun pod, and for a positive locking device for the pod adjustment gears.

1804a. FIXED GUN SIGHTS.- Not required (see paragraph 1817a).

1805. FLEXIBLE GUNS.- Not applicable.

1806a. AMMUNITION FEED CHUTES.- Applicable to space provision only.

1807a. LINK AND CASE EJECTION CHUTES.- Applicable to space provision only.

1808a. AMMUNITION BOXES.- Applicable to space provision only for ammunition boxes for the ammunition specified in paragraph 2424a.

1809a. GUN MOUNTS.- Applicable to space provision only.

1810. BLAST PROTECTION.- Not required.

1811. AMMUNITION ROUNDS COUNTERS.- Not required.

1812. FLEXIBLE GUN LATCHES.- Not applicable.

1813. GUNFIRE INTERRUPTERS.- Not applicable.

1814a. GUN CHARGING SYSTEM.- Space provision only shall be made for a pneumatic gun charging system in general accordance with Dwg. R-328a. (See paragraph 1552a and 1552b.)

1814b. GUNFIRING SYSTEM.- Space provision only shall be made for a gun firing system to permit selective firing of the gun as follows: (1) Upper pair, (2) lower pair, and (3) all guns.

1815. GUN ENCLOSURES.- Not applicable.

1816. POWER OPERATED GUN ENCLOSURES.- Not applicable.

1817a. REMOTE GUNFIRE CONTROL SYSTEM.- Applicable only to space provision for fire control equipment for the fixed guns including the AN/APQ-47 radar, including computers, (specified in paragraph 1702a), and Mk. 6, Mod.1 sight unit and Mk. 53, Mod. O amplifier.

1818. SIGHTING AND SCANNING.- Not applicable.

1819. BOMB INSTALLATION PROVISION.- Not required.

1820. BOMB DISPLACING GEAR.- Not applicable.

1821. BOMBER'S CONTROL PANEL.- Not applicable.

1822. BOMB RELEASE CONTROL SYSTEM.- Not applicable.

1823. BOMB HOISTS.- Not applicable.

1824. BOMB DOOR OPERATING SYTEM.- Not applicable.

1825. BOMB SIGHT PROVISION.- Not applicable.

1826. BOMB WARNING DEVICES.- Not applicable.

1827. TORPEDO PROVISION.- Not required.

1828. BULLET RESISTANT GLASS.- Not required.

1829. ARMOR PLATE.- Not required.

1830. ARMOR PLATE ATTACHMENT FITTINGS.- Not applicable.

1831. SMOKE SCREEN PROVISION.- Not required.

1832. BOMB DATA CONTAINER.- Not applicable.

1833a. PROVISION FOR ARMAMENT ITEMS.- Applicable to space provision only.

1834a. GUN CAMERA.- See paragraph 1939a.

1835a. PROVISION FOR ROCKETS.- Space provision only shall be made for the alternate installation of rockets in accordance with Spec. SR-164.

1836. BOMBRACK POWER RECEPTACLE.- Not required.

1837. SMOKE SCREEN APPARATUS.- Not required.

FURNISHINGS AND EQUIPMENT

1901a. GENERAL.- Furnishings and equipment shall be as specified herein.

1902. SEATS.- Applicable.

1903a. SEATS.- An ejectable type seat shall be installed for the pilot in general accordance with Spec. SR-172. In addition to the requirements for normal flight, the seat arrangement shall be such that the pilot will be in a comfortable position with good downward vision in the vertical landing attitude of the airplane. A switch shall be provided to position the tilting seat after take-off and prior to landing.

1903b. The seat arrangement shall be as follows:

(1) When the leg braces are raised the following shall occur:

- (a) Head rest is lowered to normal position.
- (b) Inertia reel is locked.
- (c) Seat catapult is armed.
- (d) Cockpit pressure dump valve is actuated.
- (e) Canopy seal is deflated.
- (f) Canopy latches is released.
- (g) Normal canopy actuator is disconnected and compressed air is admitted to a cylinder to drive the canopy to the extreme after position.

(2) After the leg braces are raised, pulling of the face curtain fires the seat catapult.

1903b. (Cont)

(3) A quick disconnect from the mechanism shall be provided to permit removal of the canopy or seat for maintenance purposes without inadvertent firing of the catapult. Warning decalcomanias with operating instructions shall be appropriately placed at all ejection controls and on both sides of the fuselage just outside of the cockpit. Wording shall be as stipulated by BuAer.

(4) The seat shall be suitable for use of the back pad, seat pan and pararaft kit specified in paragraph 2436a. Provision shall be made for the use of a seat-type parachute.

(5) The ejection seat shall be designed to be ejected only with the seat in the normal position or tilted to the hovering flight position. Mechanisms to accomplish the above operations shall be subject to BuAer approval.

1903c. Accidental loss of the canopy in flight shall not fire the seat catapult. In this case the normal sequence specified in paragraph 1903b shall eject the seat.

1903d. A manual control shall be provided to release the catapult safety pin to permit seat ejection cartridges to be fired regardless of canopy position.

1904. OTHER SEATS.- Not applicable.

1905. CHAIRS, LOUNGES, ETC.- Not applicable.

1906. LITTERS.- Not applicable.

1907. KNEE PADS.- Not applicable.

1908. HEAD RESTS.- A suitable head rest shall be provided for the pilot.

1909a. SAFETY BELTS.- A lap type safety belt NAF 1201-8 and shoulder harness, NAF 1201-9 shall be installed for the pilot's seat. The harness may be modified provided the configuration meets the strength requirments of Spec. MIL-B-5032 (Aer).

1910. SEAT CUSHIONS.- Not applicable.

1911a. INSTRUMENT BOARDS.- Spec. MIL-I-7028 shall apply except that vibration insulators need not be mounted in pairs, need not be so located that the vertical axes of all insulators are in a single vertical plane,

1911a. (Cont)

and further, that the plane need not pass through the center of gravity of the instrument board complete with instruments. All-metal vibration insulators may be used. The cabin altimeter and accelerometer need not be shock mounted if not located on the main instrument board. Consideration shall be given to mounting instruments in a manner to reduce landing shock decelerations.

1912. PARACHUTE STOWAGE.- Not applicable.

1913. TOILET FACILITIES.- Not required.

1914. WASH BASINS AND SHOWER.- Not required.

1915. PORTABLE LADDERS AND PLATFORMS.- Not required.

1916a. MAPCASE, ARM RESTS AND CHECK-OFF LISTS.- Applicable only in regard to check-off lists and map case.

1917a. FLOOR COVERING.- Applicable, only to space provision for floor covering for thermal insulation in accordance with para. 1919a.

1918. UPHOLSTERY.- Not required.

1919a. THERMAL AND ACCOUSTICAL INSULATION.- Not required. Space provision only shall be made for insulation in accordance with Spec. MIL-S-5659, MIL-S-6144 and SR-181.

1920. CURTAINS.- Not required.

1921. DRAFT SCREENS.- Not required.

1922. LOCKERS AND STOWAGE FACILITIES.- Not required.

1923. WATER CONTAINERS AND WATER STILL.- Not applicable.

1924. PROVISION FOR FOOD.- Not required.

1925a. MISCELLANEOUS EQUIPMENT.- Applicable only to the equipment specified in paragraph 2436a.

1926. FIRE EXTINGUISHING AND FIRE DETECTING SYSTEMS.- Applicable.

1927. FIRE EXTINGUISHING AND FIRE DETECTING SYSTEMS (RECIPROCATING ENGINES).- Not applicable.

1928a. FIRE EXTINGUISHING AND FIRE DETECTING SYSTEMS (TURBO-ENGINES).- A fire detecting system and a single-shot fire extinguishing system shall be provided for the engine in accordance with Spec. SR-154a-1. The weight of the fire extinguishing system shall be included in useful load.

1929. AUXILIARY FIRE EXTINGUISHER SYSTEMS.- Not required.

1930. PORTABLE FIRE EXTINGUISHERS.- Not required.

1931. VAPOR DILUTION SYSTEM COMPONENTS.- Not applicable.

1932. LIFE RAFT STOWAGE.- Not applicable.

1933. FIRST AID KIT.- Not required.

1934. BILGE AND REFUELING PUMP.- Not applicable.

1935. PYROTECHNICS.- Not required.

1936. PARACHUTE FLARES.- Not required.

1937a. PROVISION FOR ELECTRONIC EQUIPMENT.- Provision shall be made for the AN/ARC-1 equipment specified in paragraph 1702a. Space provision only shall be made for all other electronic equipment listed therein.

1938. PROVISION FOR NAVIGATING EQUIPMENT.- Not applicable.

1939a. PROVISION FOR PHOTOGRAPHIC EQUIPMENT.- Space provision only shall be made for the gun camera specified in paragraph 2434a.

1940. PROVISION FOR NIGHT PHOTOGRAPHY.- Not required.

1941a. PROVISION FOR OXYGEN EQUIPMENT.- A pressure-breathing diluter demand type oxygen system shall be provided for the oxygen equipment specified in paragraph 2433a.

1942a. VENTILATING SYSTEM.- Not applicable. (See para. 1944a.)

1943a. HEATING AND ANTI-FOGGING SYSTEM.- Not applicable. (See para. 1944a.)

1944a. CABIN PRESSURIZATION.- Cabin pressurization, heating, cooling and ventilation of the cockpit, and windshield defogging shall be provided in general accordance with Spec. SR-163a. Space provision shall be made for strict compliance with Spec. SR-163a.

1944b. Cabin pressure shut-off valves shall be provided and shall be actuated by the pressure of the engine fire extinguisher agent so as to prevent introduction of this agent into the cabin pressure system. The

1944b. (Cont)

valves shall remain closed until manually reset. The weight of these valves shall not be included in weight empty or useful load.

1945. PROVISION FOR CARGO.- Not applicable.

1946. BALANCE COMPUTER BRACKET.- Not applicable.

1947. PROVISION FOR AIRCRAFT FILES KIT.- Not applicable.

1948a. REAR VISION MIRROR.- Applicable. A rear vision mirror shall be provided for the pilot.

1949a. ANTI-BLACKOUT SUITS.- Applicable. (See paragraph 1951a.)

1950. MISCELLANEOUS ITEMS.- Applicable.

1951a. QUICK DISCONNECT.- A quick-disconnect oxygen breathing tube and radio connection assembly, BuAer Dwg. 51A40A1, shall be provided and located adjacent to the pilot's seat. The tube portion of the units shall be attached to the ejection seat in such a manner that ejection seat operation will disconnect oxygen and radio services without disconnect force being transmitted to the occupant. A separate quick disconnect fitting for anti-blackout suit connection shall be provided adjacent to the seat reference point on the left side.

ANTI-ICING EQUIPMENT

2001a. GENERAL.- Anti-icing is not required.

2002a. WINDSHIELD DE-ICING AND DEGREASING.- Not required. (See paragraph 1944a.)

2003a. PROPELLER FLUID DE-ICING.- Not applicable. (See paragraph 1266a.)

2004. CONTROLS AND OPERATION.- Not applicable.

2101. thru 2104. AUXILIARY POWER PLANT.- Not required.

AUXILIARY GEAR

2201a. GENERAL.- Auxiliary gear consists of hoisting gear.

2202. ANCHOR GEAR.- Not applicable.

2203. ANCHOR GEAR DESIGN.- Not applicable.

2204. SEAPLANE TOWING AND MOORING.- Not applicable.

2205a. LANDPLANE TOWING.- Not applicable. (See paragraph 2321a.)

2206a. HOISTING SLINGS AND FITTINGS.- Applicable to the complete airplane only. Provision shall be made for hoisting the airplane in the vertical attitude. The height of the airplane with the hoisting sling in high position may exceed 15' 6".

2207. WING HANDLING LINES.- Not applicable.

2208. SECURING STRUT PROVISION (SEAPLANES).- Not applicable.

2209. ARRESTING GEAR.- Not applicable.

2210. ASSISTED TAKE-OFF.- Not required.

2211. BARRIER CRASH PROVISION.- Not applicable.

SPECIAL EQUIPMENT

2301a. GENERAL.- Special equipment shall consist of the items specified herein. Unless otherwise specified herein, special equipment shall be furnished in the quantities specified by amendment to the airplane contract.

2302. BEACHING GEAR.- Not applicable.

2303. TARGET TOWING EQUIPMENT.- Not required.

2304a. PROPELLER AND ENGINE HOIST.- Not required, however, propeller and engine hoisting slings shall be provided with each airplane.

2304b. Removable equipment shall be provided to guide the engine during installation and removal.

2305a. BOMB HOISTS AND WORKING PLATFORMS.- Not applicable. (See paragraph 2321a.)

2306a. ENGINE COCKPIT AND AIR INTAKE COVERS.- Applicable. Adequate water tight protection shall be provided to prevent the entry of salt spray or water into the air inlet duct, tail pipe, cockpit, other openings leading into the engine or its accessories, etc. while the aircraft is at rest.

2307. AIRCRAFT LOG BOOK.- Applicable.

2308. ENGINE LOG BOOK.- Applicable.

2309. PILOT'S HANDBOOK.- Applicable.

2310. ERECTION AND MAINTENANCE INSTRUCTIONS.- Not applicable.

2311. WEIGHT AND BALANCE DATA.- Not applicable.

2312a. ENGINE SERVICE INSTRUCTIONS.- A handbook of engine service instructions will not be furnished.

2313. PROPELLER LOG BOOK.- Applicable.

2314. AIRCRAFT FILES KIT.- Not applicable.

2315. STEERING AND TOW BARS.- Not applicable.

2316. JACK PADS.- Not applicable.

2317. ENGINE QUICK CHANGE ADAPTERS.- Not required.

2318a. CONTROL SURFACE LOCKS.- Suitable external control surface battens shall be provided with each airplane.

2319. WING SECURING DEVICES.- Not applicable.

2320. BORESIGHT KITS.- Not required.

2321a. HANDLING TRAILER.- A handling trailer shall be provided with each airplane, for handling the airplane on the ground and shall include provision for rotating the airplane to a horizontal position and for positioning the airplane for take-off. The handling trailer shall have provision for towing forward and pushing backward. It shall be possible to use the handling trailer as a maintenance cradle or platform, permitting fin replacement while the airplane is so supported. A gas turbine compressor shall be installed on each handling trailer.

2322a. Suitable ground equipment shall be provided with each airplane to prevent oleo action during heavy weather and when removing oleo strut.

2323a. Suitable removable tie down adapters shall be provided with each airplane to attach to wing hoist fittings and handling fittings.

2324a. Special equipment (platforms, slings, etc.), not specifically noted elsewhere, shall be provided as required for servicing and maintenance of the airplane.

USEFUL LOAD

2401a. GENERAL.- The useful load shall consist of a pilot, fuel, oil, equipment, ballast, fire extinguishing system and instrumentation equipment.

2402. OVERLOADS.- Applicable.

2403a. CREW.- The crew shall consist of a pilot.

2404. CREW WEIGHT FOR MILITARY AIRCRAFT.- Applicable.

2405. CREW WEIGHT FOR NON-MILITARY AIRCRAFT.- Not applicable.

2411. FUEL WEIGHT.- Applicable.

2412. FUEL CATEGORIES.- Applicable.

2413a. FUEL LOAD.- The quantity of fuel carried for the engine shall be 417 gallons.

2414a. FUEL ALLOWANCE.- Applicable only to 10 gallons of fuel trapped in system.

2415. AUXILIARY FUEL TANKS. - Not applicable.

2416. OIL WEIGHT.- Applicable.

2417. OIL CATEGORIES.- Applicable.

2418a. OIL LOAD.- The quantity of oil carried for the engine installation shall be 12 gallons.

2419. ALLOWANCE FOR BAGGAGE AND PERSONAL EFFECTS.- Not required.

2420. ALLOWANCE FOR CARGO.- Not required.

2421. WATER-ALCOHOL MIXTURE.- Not applicable.

2422. WATER-ALCOHOL MIXTURE LOAD.- Not applicable.

2423a. ARMAMENT.- Not applicable.

2424a. FIXED GUN INSTALLATION.- The fixed gun installation for which space provision is made shall consist of the following:

2424a. (Cont)

4	- 20mm aircraft guns, Mk. 12-0 without cradles but including four feed mechanisms, Mk. 7 (two right and two left), four gun heater systems, Aero 4A	450#
600	- Rounds of 20mm ammunition	408
2	- Gunpods (including gunmounts)	140
4	- Ammunition boxes	60
	Total	1058#

2425a. ROCKET INSTALLATION.- The rocket installation for which space provision is made shall be an alternate installation to the gun installation for which space is provided and shall consist of the following:

46	- Folding fin rockets, 2.75 inches (23 in each pod)	828#
2	- Rocket pods	418
	Total	1246#

2431a. EQUIPMENT.- Equipment consists of oxygen and miscellaneous equipment.

2432. NAVIGATING EQUIPMENT.- Not applicable.

2433a. OXYGEN EQUIPMENT.- Oxygen equipment shall consist of the following:

1	- Oxygen cylinder with valve assembly BuAer SK1084-514	22.5#
1	- Regulator, Pioneer 2867-A1 composite type	2.5
	Total	25.0#

2434a. PHOTOGRAPHIC EQUIPMENT.- Photographic equipment for which space provision only is made shall consist of the following:

1	- Gun camera, AN/N6A with integral overrun	3.0#

2435. PYROTECHNIC EQUIPMENT.- Not required.

2436a. MISCELLANEOUS EQUIPMENT.- Miscellaneous equipment shall consist of the following:

1	- Pararaft kit, PK-2	23.0#
1	- Seat pan, SP-1	3.7
1	- Back pad, BP-1	3.1
	Total	29.8#

2437a. OTHER ITEMS.- Additional items of useful load are as follows:

Ballast	230#
Flight test instrumentation	218
Fire extinguishing system	64
Total	512#

APPENDIX 1-A

The following equipment shall be furnished by the Government and installed by the Contractor in each airplane.

ITEM	QTY	NOMENCLATURE	IDENTIFICATION	WEIGHT
PROPULSION				
(Weight Empty)				
1	One	Allison XT40-A-14 turbo-prop	(see Appendix 4)	2837#
2	One	Allison power measuring equip		65
3	One	Propeller, Curtiss 16'0" dia., 6 blades complete with feathering equipment and rotating spinner	(See Appendix 6) C(6L8)65S-A/1060-1061-10C5-36	1885
4	One	Starter, pneumatic	BuAer Model XA-9	22.0
5	One	Motor actuated starting valve	BuAer Model V-1	3.0
			Total	4812.0#
(Special Equipment)				
6	One	Gas turbine compressor (Ground Equipment)	AiResearch GTC 43/44-6	

ITEM	QTY	NOMENCLATURE	IDENTIFICATION STOCK NO.(R88-)	IDENTIFICATION DWG.(SPEC)NO.	WEIGHT
INSTRUMENTS (Weight Empty)					
		Flight Instruments			
1	One	Accelerometer	A0140-015	AN5745L3	0.9#
2	One	Altimeter	A0351-011	AN5760L4B	2.6
3	One	Card, airspeed correction	C0152-000	BAD9860-3	Neg
4	Two	Card, compass correction	C0195-000	AN5823-1	Neg
5	One	Holder, correction card	H0500-000	BAD 1083-SK	0.2
6	Two	Holders, correction card	H0570-000	AN5800-1	Neg
7	One	Compass, standby	C0779-525	AN5766T3(Mod)	0.8
8	One	Indicator, cabin press, altimeter	I0625-000	MIL-I-5099(Aer)	0.5
9	One	Indicator, airspeed (max allow)	I0474-010	AN5863T4	1.3
10	One	Clock, elapsed time	C0574-000	B/A51A45A1-1	0.6
11	One	Indicator, climb	I0750-110	AN5825T6	1.0
12	One	Indicator, gyro horizon	I1332-000	MIL-I-5133A	3.2
13	Two	Indicator, hyd. press., small	I1937-005	B/AXAE-43 Type I	1.2
14	Two	Transmitter, hyd.press.	T2651-255	B/AXAE-43 Type V	2.8

ITEM	QTY	NOMENCLATURE	IDENTIFICATION STOCK NO.(R88-)	IDENTIFICATION DWG.(SPEC)NO.	WEIGHT
INSTRUMENTS (Weight Empty)					
		Flight Instruments			
15	One	Indicator, turn and bank (Type C-6)	I3221-025	AF21328	1.8
16	One	Tube, pitot-static	T3305-000	AN5816-2	1.0
		Engine Instruments			
17	Two	Indicator, oil press (power section)	I1937-025	B/AXAE-43 Type III	1.2
18	Two	Transmitters, oil press	T2574-000	B/AXAE-43 Type II	2.8
19	Two	Indicator, tachometer	I2600-000	BUA:50A45A1	1.8
20	Two	Generator, tachometer	G1320-050	AN5544-3	3.2
21	Two	Resistor, thermocouple	R0383-050	AN5534-1	0.1
22	As req.	Lead, thermocouple	L0515-250	MIL-W-5846A, Type III	
23	One	Indicator, oil temp	I2641-000	B/AXAE-36	1.0
24	One	Bulb, thermometer	B0890-000	AN5525-1	0.2
25	One	Indicator, oil press (gear box)	I1937-010	B/AXAE-43 Type II	0.6
26	One	Transmitter, oil press	T2070-000	B/AXAE-43 Type III	1.2
27	One	Indicator, turbine time	I3300-000	NAF1278-1	2.3
				Total	32.3#

ITEM	QTY	NOMENCLATURE	IDENTIFICATION	WEIGHT
ELECTRICAL (Weight Empty)				
1	One	Voltammeter	NAF1225-450	1.0#
2	One	Inverter	E-52804	30.0
3	One	Battery, 36 ampere-hour	AN-3150-2	80.0
4	One	Generator DC, 400 amp	E-1604-1	61.0
5	One	Voltage regulator, DC and base	E-1597-1	5.0
6	One	Reverse current relay	AN3025-2	2.5
			Total	179.5#
ELECTRONICS (Weight Empty)				
1	One	VHF Transceiver	AN/ARC-1	52.5#

Note: Cables, plugs, and bracketry are not included in the above electronic weight.

ITEM	QTY	NOMENCLATURE	IDENTIFICATION	WEIGHT
MISCELLANEOUS EQUIPMENT				
		(Weight Empty)		
1	One	Personnel ejection catapult	NAF602200-1 (NAMC Type I)	10.0#
2	One	Personnel ejection catapult cartridge	Mk.1, Mod. 0	0.5
3	One	Shoulder harness	NAF1201-9	2.0
4	One	Safety belt	NAF1201-8	2.5
5	One	Anti-G suit reg. valve	AN6538-2	1.8
6	One	Anti-G suit filter	AN6538-3	1.0
			Total	17.8#
		(Useful Load)		
7	One	Oxygen cylinder (514 cu. in) with valve assembly	BuAer SK1084-514	
8	One	Composite diluter demand type regulator	Pioneer Mod. 2867-A1	
		(Special Equipment)		
9	One	Airplane Log Book		
10	One	Engine Log Book		
11	One	Propeller Log Book		

Total weight of weight empty GFE = 5094.1#

APPENDIX 1-B

The following equipment will be furnished and installed by the Government in each airplane as required. However, the contractor shall make suitable provision therefor and also a trial installation in the first airplane to insure satisfactory operation. Drawings or samples of this equipment will be furnished for trial installation.

ITEM	QTY	NOMENCLATURE	IDENTIFICATION
MISCELLANEOUS (Useful Load)			
1	One	Pararaft kit	PK-2
2	One	Seat pan	SP-1
3	One	Back pad	BP-1

APPENDIX 1-C

The following items of equipment shall be included in the equipment to be furnished and installed by the contractor in each airplane.

ITEM	QTY	NOMENCLATURE	IDENTIFICATION
PROPULSION			
1	Three	Fuel Booster pumps	
2	Two	Hydraulic pumps	
3	One	Fuel strainer	
4	Two	Fuel shut-off valves	
5	One	Oil tank	
6	One	Oil shut-off valve	
7	One	Gear box, dual accessory drive	
8	One	External breakaway air connection	
INSTRUMENTS			
1	One	Capacitor type fuel quantity gage equipment	
2	One	Trim position indicator and transmitter (elevator)	
3	Two	Indicator, engine air inlet temp	Lewis 149E6
ELECTRICAL			
1	One	External power receptacle, break away connector	
2	As req.	Fuel nozzle receptacles	AND-10439
3	As req.	Switches and relays	
ELECTRONICS			
1	One	Set cable, terminals, and plugs, as req	
2	As req.	Static dischargers	
ARMAMENT			
1	Two	Simulated gun pods	
MISCELLANEOUS			
1	One	Airplane hoisting sling	
2	One	Check-off list	
3	As req.	Fire extinguishing and detecting system	
4	Two	Hydraulic systems	
5	One	Pneumatic system	
6	One	Pilot ejection seat	CV6-406050

ITEM	QTY	NOMENCLATURE	IDENTIFICATION
7	One set	Guide rails (seat)	CV6-406536-1,-2
8	One	Pilot's handbook	
9	As req.	Cabin heating, ventilating and pressurization equipment	
10	One	Composite quick disconnect	B/A51A40A1 (MIL-T-7025 (Aer))
11	One	Handling trailer	
12	One	Alighting gear wheels	

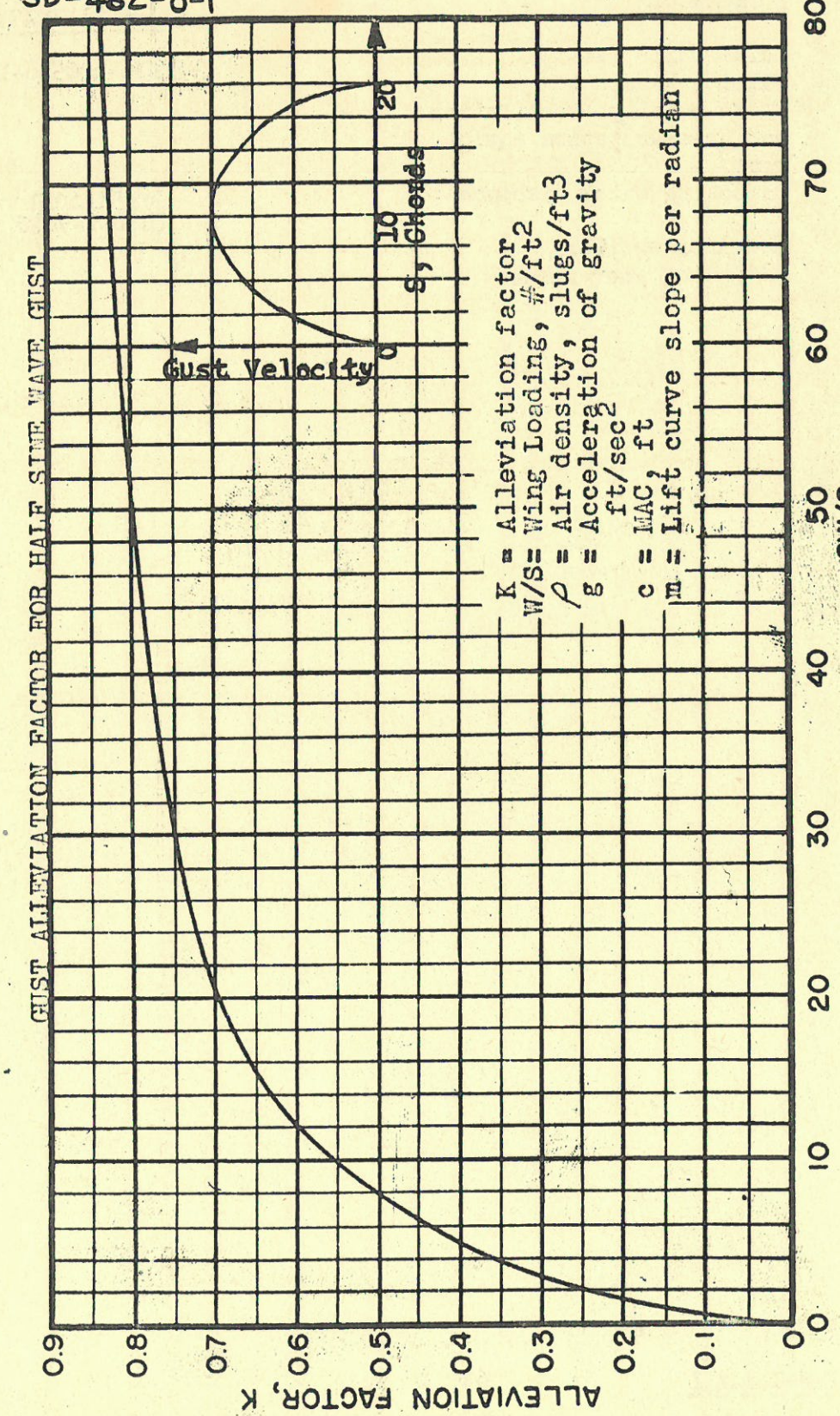


FIGURE 3.223m GUST ALLEVIATION FACTOR

APPENDIX 5

LIST OF APPENDICES

1A - List of Government furnished - Contractor installed equipment.
1B - List of Government furnished - Government installed equipment.
1C - List of Contractor furnished - Contractor installed equipment.
2 - Consolidated Vultee Aircraft Corporation General Arrangement Drawing No. 5-00001.
2A - Consolidated Vultee Aircraft Corporation General Arrangement Drawing No. 5-00007 (Military configuration)
3 - Consolidated Vultee Aircraft Corporation Inboard Plan and Profile Drawing No. 5-00005.
3A - Consolidated Vultee Aircraft Corporation Inboard Plan and Profile Drawing No. 5-00006 (Military configuration)
4 - Allison Specification No. 300A dated 1 March 1950, Revised 5 September 1950.
5 - Gust Alleviation factor vs mass parameter.
6 - Curtiss Proposed Propeller Specification No. C-2210, dated 3 April 1951 and Curtiss Curves A-2736, A-2737 and A-2738.